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The International Journal of Orthodontia

Editor: Martin Dewey, D.D.S., M.D.

VOL. III ST. LOUIS, JANUARY, 1917 NO. 1

ORIGINAL ARTICLES

FACE FACTS

(*Continued from page 408, Vol. II.*)

BY B. E. LISCHER, D.M.D., ST. LOUIS.

Professor of Orthodontics, Washington University Dental School.

IN the remaining essays of this series the writer will describe briefly the structural changes and disturbances of function of dentofacial deformities, outline the prognosis of the principal types, and incidentally demonstrate the utter fatuity of a numerical diagnostic terminology.

VIII. PATHOLOGY, PROGNOSIS, AND FACIAL TYPES OF NEUTROCLUSION.

Neutroclusion may be defined as a term applicable to cases of malocclusion of the teeth presenting a neutral, or normal, mesio-distal relation of the dental arches. Sundry extreme bimaxillary malformations present arch relationships of this type, but they are excluded from this group because they justify separate consideration. They will be described in a subsequent chapter.

Neutroclusion may also be defined as a class of oral deformities comprising a large variety of abnormal dental and facial types. For the sake of convenience, the various forms included in this class may be divided into *simple neutroclusion and complex neutroclusion.* The former term is applicable to all simple cases, especially when in the first stages of maldevelopment. These frequently present what have been termed "mixed dentures:" i.e., dentures composed of temporary as well as permanent teeth. Under complex neutroclusion we may include all neutroclusion cases presenting facial deformity and anomalies of dentition which are commonly regarded as complicated.

The relative frequency of these two forms is not known. Of 500 models in the author's collection which have thus far been indexed, 163 belong to the simple neutroclusion group and 185 were diagnosed as complex. It should not be forgotten, however, that an orthodontist's models are made of abnormal den-

tures and that the correct percentage should be based upon the findings in at least one thousand individuals taken at random.

Malposition of one or more teeth is always present and constitutes the primary pathological feature, resulting in an *anomaly of arch form.* Varying degrees of deformity of the face and alveolar process are also met with, as well as abnormalities of the nasal tract and accessory sinuses, abnormal nasal and lip function, abnormal articulation in speech, dental caries, anomalies of form, of number, and of eruption of the teeth, etc.

SIMPLE NEUTROCLUSION.

Fig. 39 shows models of a case of simple neutroclusion at eight years of age. It will be noticed that this denture is composed of twelve temporary and

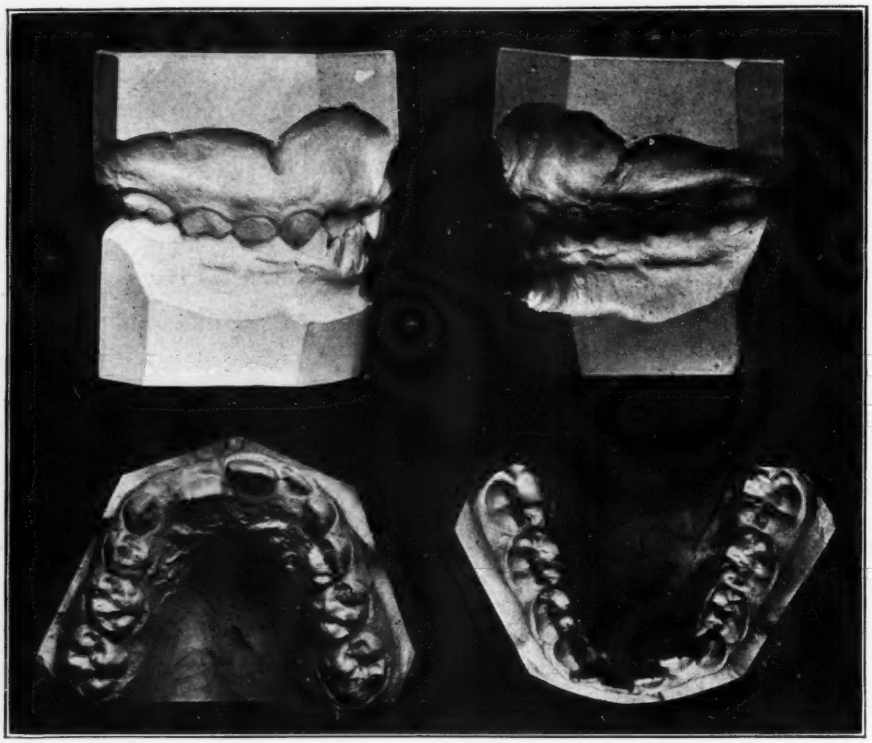

Fig. 39.—A common form of simple neutroclusion at eight years.

eleven permanent teeth. A crowding of the incisors and an arrest of development in the alveolar process, which prevented the labial and buccal expansion of the dental arches, are the principal characteristics to be considered. My record shows that the facial features are not involved, that the child is immune to caries, her general health excellent and her weight and development above the normal for her age. Her history reveals that her parents suffer from malocclusion of the teeth, but otherwise it is entirely negative.

The cause, or causes, of such a denture are unknown. It may be that diet and disuse are causative factors of considerable importance; but the immunity to caries in this instance precludes their acceptance. Some writers would probably blame heredity, or at least hereditary predisposition, as a cause

—these are very convenient terms—but in the light of our present knowledge of heredity and the very meager statistics regarding its "influence" upon human dentition, we are utterly unable to establish such a claim.

But this we do know, that if this child's denture is not corrected at this age the malocclusion will become more firmly established and very probably more complicated. In other words, an upper central incisor in linguoversion will never correct itself; and the subsequent shedding of the remaining temporary teeth practically never promotes the normal eruption of succedaneous teeth into an already crowded arch. On the other hand, mechanical intervention at this time may easily be made to promote growth, and it is certainly most opportune.

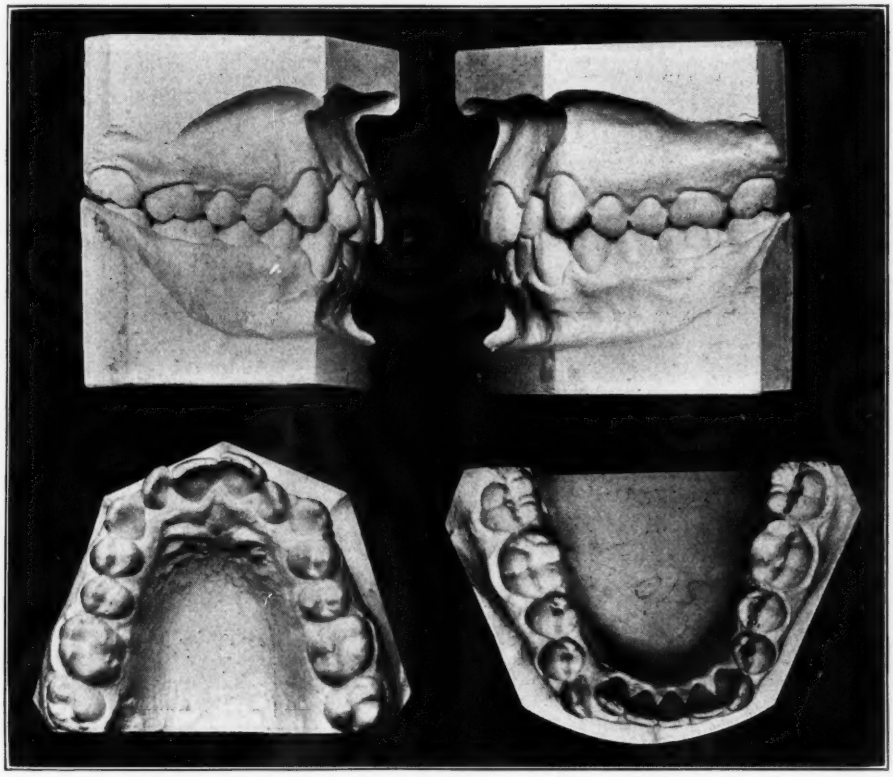

Fig. 40.—Simple neutroclusion of the permanent teeth at fourteen years.

Fig. 40 is made from models of a similar case at the age of fourteen years which was undoubtedly in process of maldevelopment at eight years. Six years of neglect did not result in a cure, and though it may still be diagnosed as a simple neutroclusion, nothing has been gained by postponing the treatment. Obviously, time and nature, unaided, did not exercise a corrective influence; and in this connection we ought to remember that most malocclusions are progressive, not static. The prognosis of oral deformities is about as favorable as the prognosis of dental caries; their evil consequences are equally certain. Of course, every practitioner can relate case histories which showed some improvement without treatment; the natural forces of growth seemed to so assert themselves that intervention became unnecessary. But our records are

so poor and our case histories so inaccurate and inadequate, that any orthodox generalization regarding the advantages (?) of deferred treatment is decidedly delusive.

Dentures like the above frequently follow a perfectly normal temporary

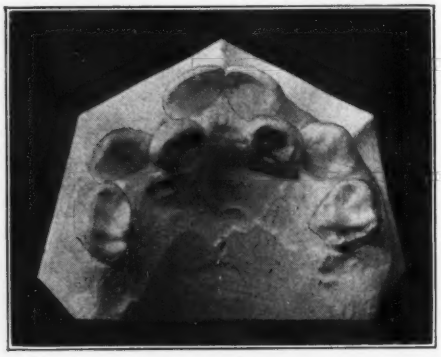

Fig. 41.—An upper dental arch at three years showing extreme linguoversion of the lateral incisors. The second molars have not yet erupted.

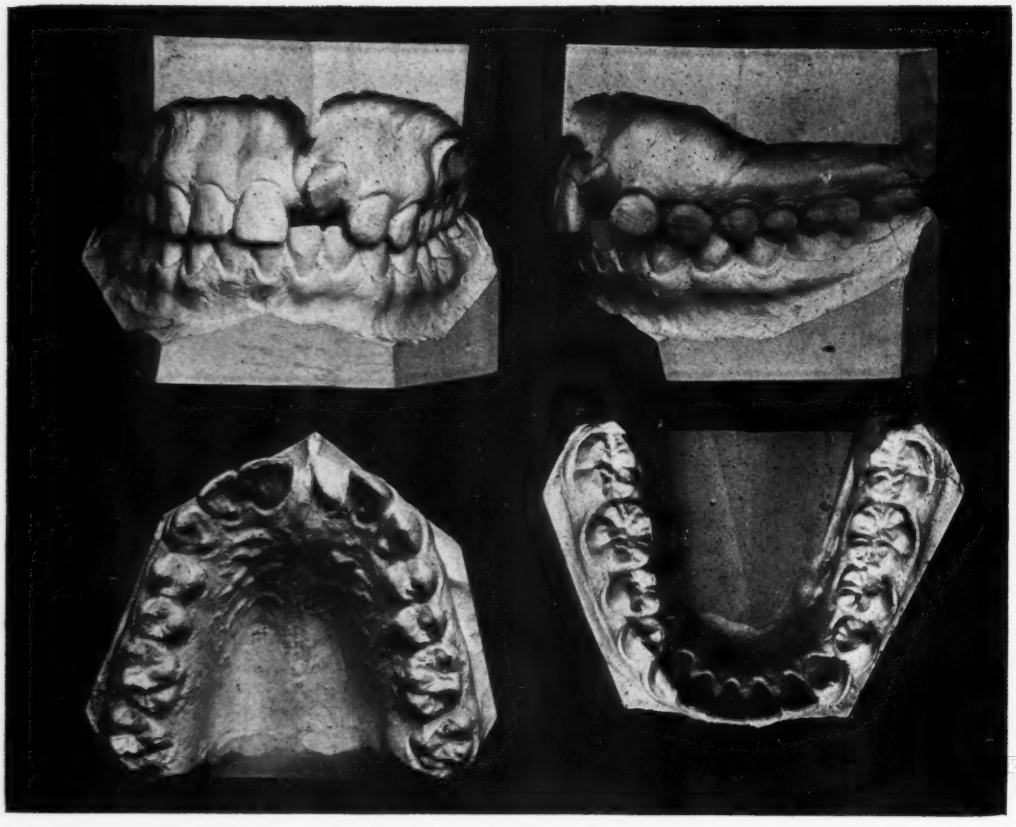

Fig. 42.—A rare form of simple neutroclusion at the advanced age of fourteen years.

dentition and many orthodontists are, therefore, of the opinion that the temporary teeth are rarely abnormal, that most malocclusions begin with the eruption of the permanent teeth. They further hold that most oral deformities are acquired and the result of environmental influences which affect the per-

manent teeth only. But such conclusions are contingent because we have no statistics to confirm them.

Fig. 41 shows an upper arch of a girl three and one-half years old with a pronounced linguoversion of the lateral incisors. It will also be noticed that the second temporary molars have not yet erupted. It is very unfortunate that the relative frequency of the various types of malocclusion in purely *temporary dentures* is unknown.

Fig. 42 shows models of an unusual case of simple neutroclusion at the age of fourteen. The reader will note that all of the temporary teeth have been lost and that all of the permanent teeth except the third molars have

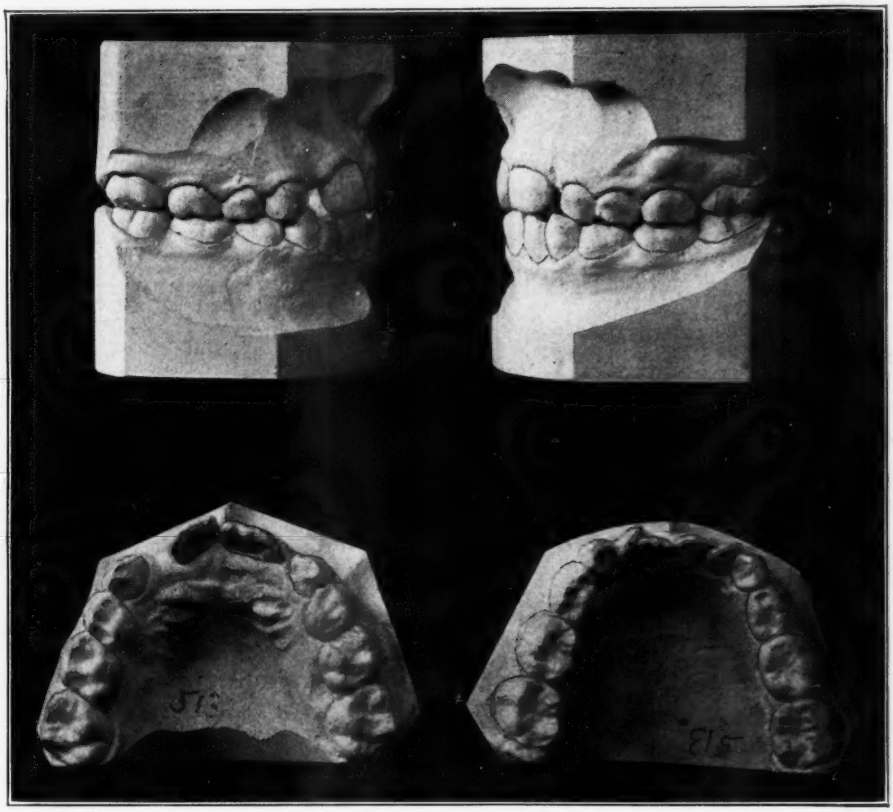

Fig. 43.—An early stage of a severe form of neutroclusion at seven years. Compare with Fig. 44.

erupted. Only two of the permanent teeth are in malposition and the mesio-distal space for the left upper central incisor is ample for its correction, which is very rare at so advanced an age.

The history of this case was entirely negative and the teeth were free from caries. The most important pathological features may be enumerated as follows: torso-infraversion of the upper central incisor and torsoversion of the left upper lateral; an overdevelopment of the frenum of the upper lip and a slight impairment of articulation in speech. The abnormality was quite visible during animated conversation and laughter, but the well developed lips gave no hint of the deformity within when they were in repose.

In Fig. 43 the denture of a boy seven years old is shown which exhibits

marked arrest of development in both arches. The space between the upper permanent central incisors and temporary cuspids is wholly inadequate for the accommodation of the permanent lateral incisors. Several of the deciduous teeth are affected by caries, and the function of mastication has thus been seriously impaired. Adenoids are also present and the general physical development of the lad is subnormal. His parents suffer from malocclusions of the neutroclusion type and a younger brother has recently been put under treatment for a pronounced bilateral distoclusion. An older sister, on the other hand, has a normal denture. But the main reason for presenting this case

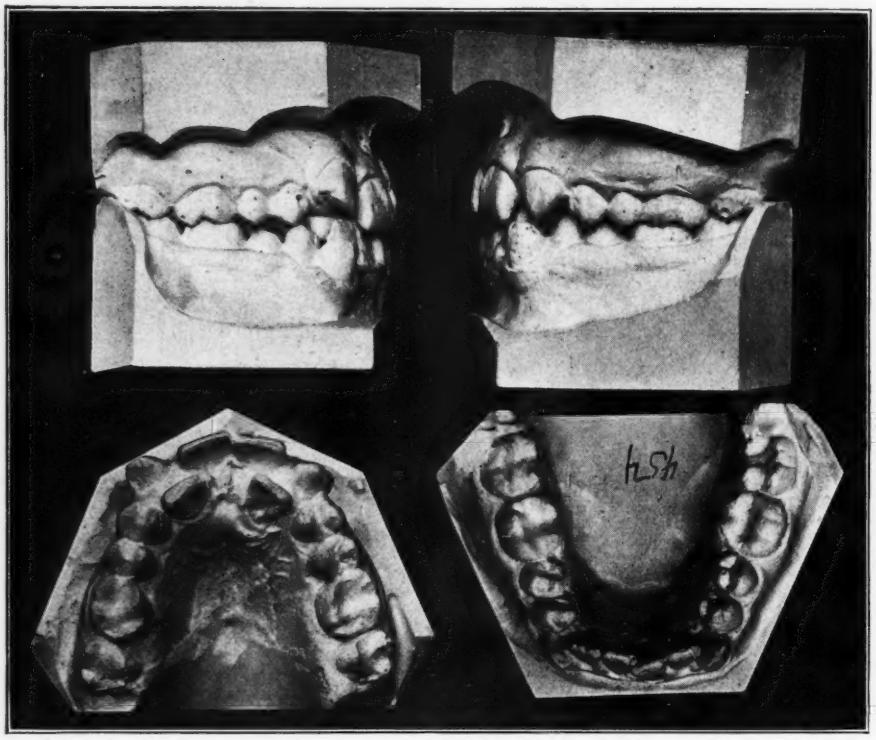

Fig. 44.—The ultimate result of delay; age fourteen.

is to show that it is the beginning of a far more complex type, Fig. 4. The latter is made from a girl fourteen years old. At seven years this denture was in all probability similar to the one shown in Fig. 43.

In Fig. 45 we note a neutroclusion at thirteen years presenting an abnormal development of the frenum of the upper lip and consequent distoversion of the upper central incisors. The upper laterals are in extreme linguoversion and the upper cuspids, bicuspids and molars slightly so. We may also note a marked arrest of development in the alveolar process surrounding the upper anterior teeth, and a crowding of the lower incisors. The arrest of development was further complicated by nasal obstruction (due to adenoids), an impairment of the voice and a slight malrelation of the lips. Caries in several of the teeth had been treated by a dentist and the nasal passages were subsequently treated by a rhinologist. The linguoversion of the upper lateral incisors could at least have been partially prevented by treatment of the central

incisors prior to the eruption of the laterals. In Fig. 46 the models of a similar case at seven years are shown. In most cases an early treatment of the centrals is therefore advisable.

If the histories of individuals presenting this type are carefully studied, they will usually reveal the existence of an abnormal frenum and a wide space (diastema) between the central incisors during the entire period of the temporary teeth. And I am convinced that it is a mistake to speak of an abnormal frenum as a "local" or "acquired" cause. In fact Wiedersheim has shown

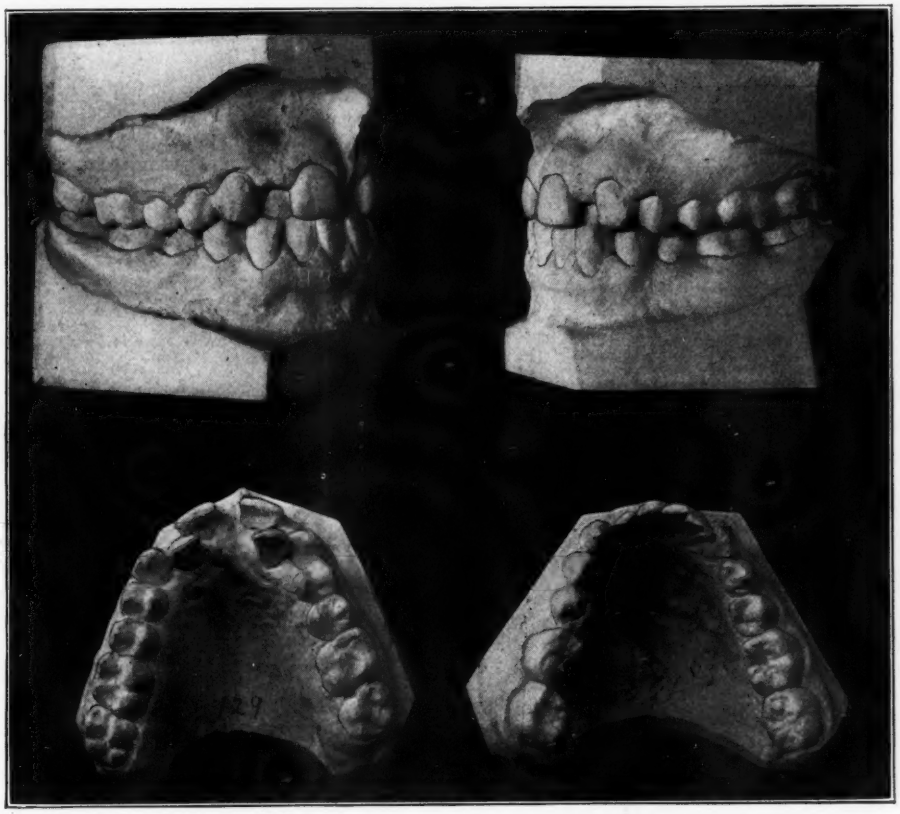

Fig. 45.—A neutroclusion with abnormal frenum of the upper lip at thirteen years; compare with Fig. 46.

that the raphe and papilla palatina are more highly developed in the embryo and during early infancy than in later life; that after birth, as the period of tooth eruption approaches, they diminish in size. It is probable that in these abnormal cases this diminution does not take place. The papilla palatina has been investigated by Merkel, who found it to be a sensory organ and he suggests that in early life it probably assists the palatine ridges in the trituration of food.

The writer has frequently observed the same abnormalitiy in one of the parents (sometimes in both) of children placed in his care for its correction. Its embryonic origin undoubtedly favors transmission by heredity. In his index of 500 cases an abnormal frenum of the upper lip occurred 39 times and in only one of these was the frenum of the lower lip similarly affected. Ketcham's investigations with the x-ray demonstrated that such maldevelopments in

the upper jaw are not related to an opening of the maxillary suture. Deficiency of number and size of one, or both, upper lateral incisors is quite frequently found in malocclusions of this type.

COMPLEX NEUTROCLUSIONS.

Cases belonging to this group differ from the foregoing in that they are more complicated. In many instances the patients are older, more teeth are involved and the deviations have become more firmly established.

(A) NEUTROCLUSION COMPLICATED BY ANOMALIES OF NUMBER.

In Fig. 47 a case of neutroclusion complicated by deficiency of number is

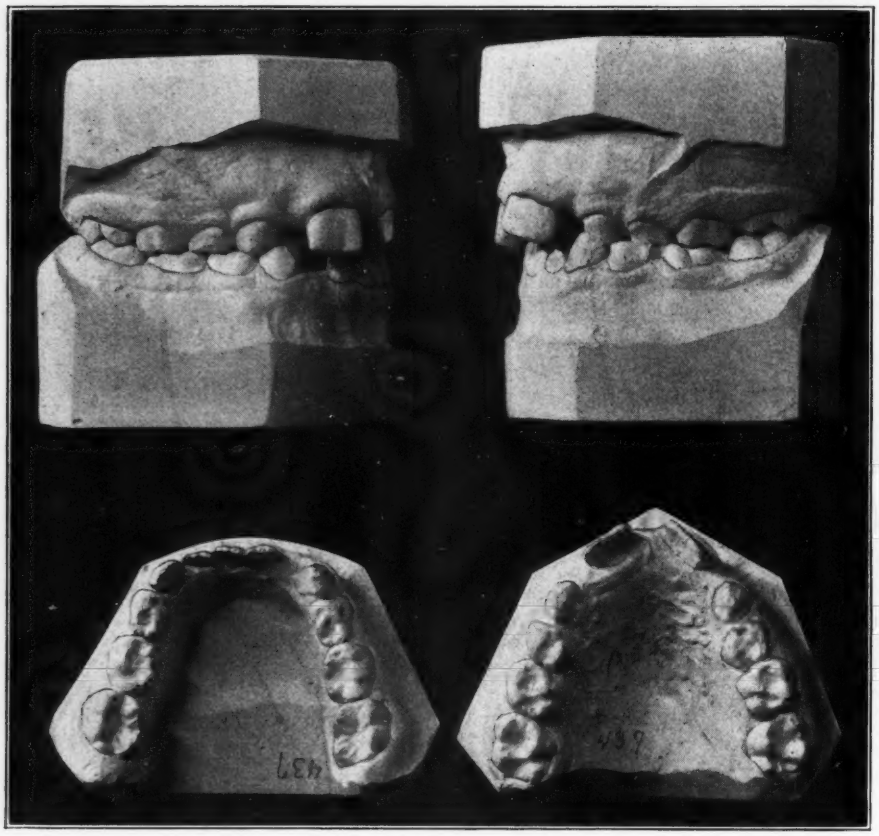

Fig. 46.—An incipient neutroclusion at seven years; compare with Fig. 45.

shown. The patient is a girl eight years old and presents an abnormal development of the frenum of the upper lip. The teeth were not affected by caries and the child's general physique was of normal development. In obtaining her history, the removal of adenoids at six and eight years was related. The rhinologist who referred the patient volunteered the information that while treating the father for a chronic nasal affection a premarital lues was admitted. On examination I found his denture not only normal, but ideal in every respect. The mother of the child, on the other hand, had no upper lateral incisors. Radiographs of the child's intermaxillary were therefore advised and they revealed the absence of the permanent lateral incisors (Fig. 48). The arrest of

development about the roots of the upper central incisors was very marked and the missing laterals complicated matters considerably. The upper lip was also in malrelation, presenting a flat, "window-shade" appearance.

It is probably of interest to note that the child's teeth are of a light shade, eye color bluish gray, complexion fair and hair color very light brown—in every instance like the mother. The father's teeth are of a dark yellow shade and much shorter mold, eye color very dark brown, complexion dark and hair black. Hence we ask: "Was the syphilis of the father the cause of the re-

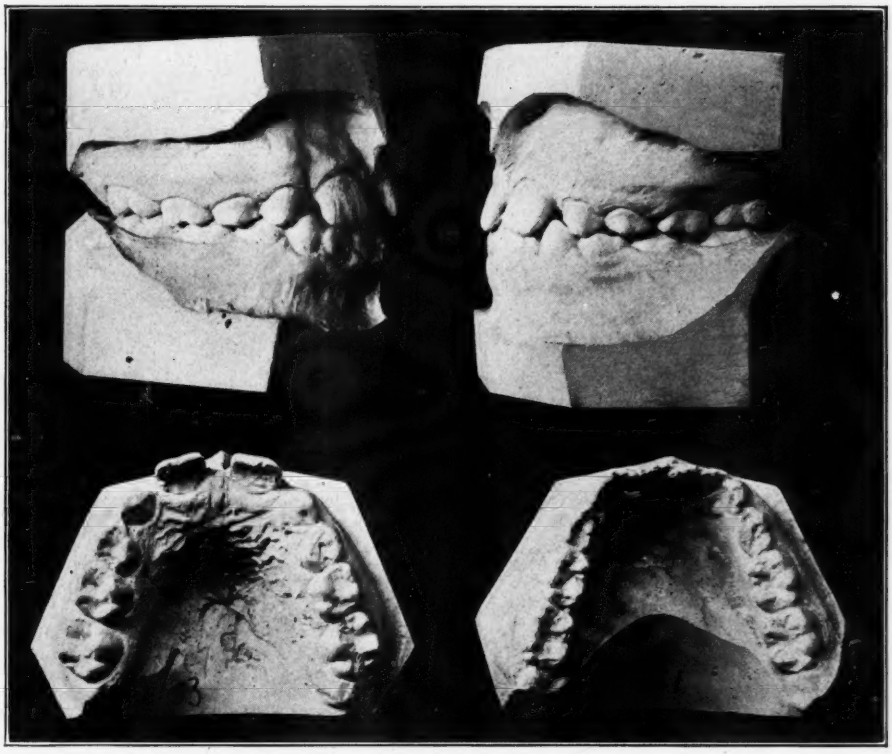

Fig. 47.—Neutroclusion complicated by deficiency of number and facial deformity; age eight years.

Fig. 48.—Radiograph of Fig. 47.

cessive tendency of all paternal characteristics and the dominance of the maternal, including the deficiency of number in her teeth?"

The relative frequency of anomalies of number in either the temporary or permanent teeth is unknown, though their causal relation to malocclusions is quite generally recognized. According to Busch, there are three kinds of supernumerary teeth: (a) those with conical crowns and roots; (b) tubercles; and (c) supplemental teeth, or those of normal form (Hollander). Premature extraction of a temporary molar, or other traumatic influences, might

occasionally be responsible for a deficiency in the permanent series, but it is obvious that most anomalies of number are not due to extraneous causes. Atavism has long been regarded as a cause of redundancy; and more recently, their budding off from the common dental lamina has been suggested as a probable explanation of supernumerary teeth. But according to Tomes, "our present knowledge of the subject will not enable us to recognize the cause which

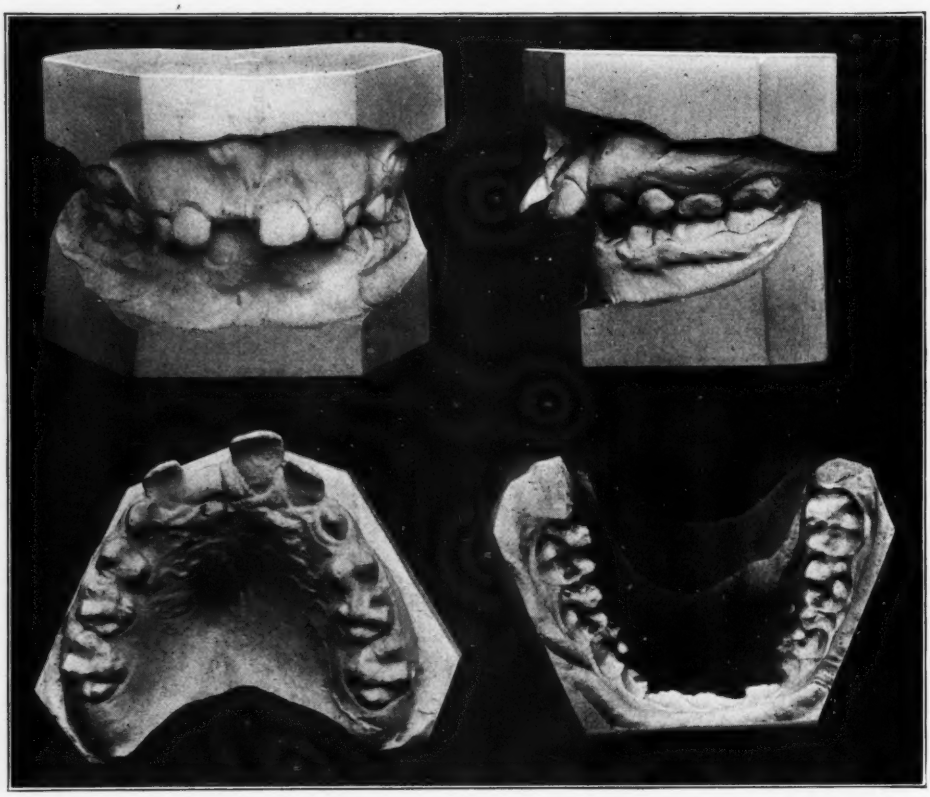

Fig. 49.—Neutroclusion complicated by labioversion of 2,|1, 2, facial deformity and perversion of $\underline{1}|$ due to a supernumerary tooth.

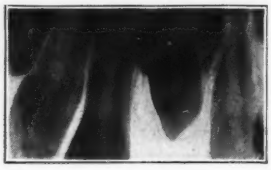

Fig. 50.—Radiograph of case shown in Fig. 49.

has produced" anomalies in the number of teeth, though syphilis, rickets and other maladies have frequently been mentioned.

McQuillen, Tomes, and many other investigators have recorded numerous cases where anomalies of number were transmitted through several generations of the same family. In Fig. 49 the models of a patient 9 years old are shown which exhibit marked labioversion of three upper incisor teeth and tardy eruption of the *right* upper central incisor. The child was an only daughter and her parents were worried about the consequent facial deformity. They also

felt certain that the delayed eruption of the central incisors was abnormal and hence came in consultation. A hard mass could plainly be felt underneath the gum, which gave assurance that the central incisor was only impacted. The father then related the following: he had a similar "space" on his *left* upper side until his seventeenth year, when two teeth erupted simultaneously, one

Fig. 51.—Neutroclusion complicated by perversion, deficiency and redundancy.

Fig. 52.—Radiograph of Fig. 51.

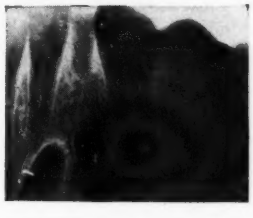

Fig. 53.—Radiograph of Fig. 51.

considerably lingual to normal. A radiograph was now advised and the result is clearly shown in Fig. 50. In the opinion of the writer, this oral deformity could very appropriately be expressed as follows: *Neutroclusion* complicated by labioversion of $\underline{2|1, 2}$, facial deformity and perversion of $\underline{1|}$, due to a supernumerary tooth.

Anomalies of number like that in Fig. 49 are not due to extraneous influences; they may in truth be said to be the result of intrinsic factors; in all probability they are transmitted from parents to offspring by the germ cells.

In Fig. 51 a case of neutroclusion complicated by perversion of $\frac{3}{2}|$ deficiency of $\underline{2}|$ and a dentigerous cyst containing three small supernumerary teeth is shown. The radiographs are shown in Figs. 52 and 53. The patient is a young miss of fifteen years whose older brother was treated some years ago for a malocclusion. Her general health and development are above the normal for her age. In such instances it is not always possible to procure an accurrate history and thus trace the transmission of the anomaly through several generations.

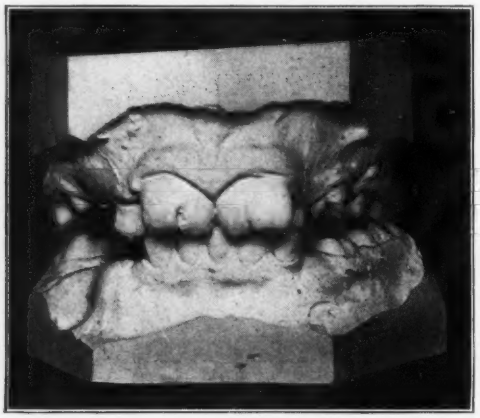

Fig. 54.—Neutroclusion complicated by anomalies of form.

(B) NEUTROCLUSION COMPLICATED BY ANOMALIES OF FORM.

Though rarely met with anomalies of form occasionally complicate malocclusions of the teeth. They suggest interesting morphological questions and may be classified into deficiency, or redundancy, of form and dichotomes. In the anterior teeth they usually present a disfigurement exceedingly difficult, if not impossible, to correct and frequently cause malocclusion of the adjoining teeth. Fig. 54 shows the models of a boy's denture at nine years complicated by dichotomes and deficiency of number. The malocclusion is of the neutroclusion type.

(C) NEUTROCLUSION COMPLICATED BY EXTREME ANOMALIES OF POSITION.

Extreme anomalies of position are relatively very common though their frequency is unknown, and they are found as complications in practically every type, or class, of dentofacial deformity. The causes are readily understood in some cases, but in others they remain obscure. The premature loss of temporary and permanent teeth are universally accepted as causative factors. In Fig. 55 the denture of a boy twelve years old is illustrated. The reader will note an extreme mesio-version of the upper, first permanent molars. The upper, first bicuspids are slightly in distoversion and the second bicuspids in perversion. Fig. 56 shows the radiographs of the right and left side of this denture and the impacted second bicuspids are revealed therein. The tem-

porary teeth of this child were extensively affected by caries and the deciduous molars were lost early. This permitted the mesial movement of the erupting first permanent molars and the impaction of the second bicuspids. In many cases this occurs only on one side of the mouth, and in others the first and second bicuspids also shift mesially, thus encroaching on the cuspid spaces. The latter in such instances, because they erupt considerably later, are usually in labioversion.

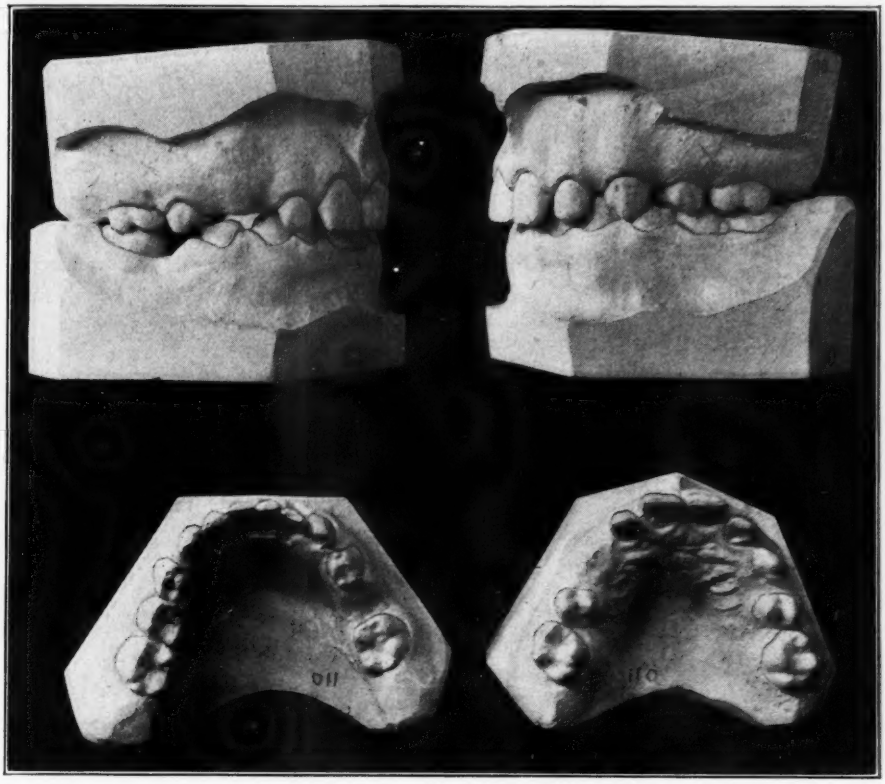

Fig. 55.—Neutroclusion complicated by mesioversion of 6|6 and perversion of 5|5.

Fig. 56.—Radiographs of Fig. 55.

In Fig. 57 the models of a boy fourteen years old show a neutroclusion complicated by mesioversion of the upper bicuspids and molars on both sides. Some practitioners would probably diagnose this case as a bilateral distoclusion, but the writer confidently believes that the profile should be taken into consideration (Fig. 58). We must also consider the perfectly formed lower arch and well developed chin. Furthermore, it is easily conceivable that if the deciduous second, upper molars were lost prematurely, the first, permanent molars might readily shift into a mesioversion at from six to eight years. The

bicuspids may subsequently follow the lines of least resistance if the temporary first molars and cuspids are lost prematurely and the permanent cuspids will thus erupt as shown in the illustration.

Fig. 57.—Neutroclusion complicated by mesioversion of 7, 6, 5, 4|4, 5, 6, 7.

Fig. 58.—Facial form of Fig. 57.

Occasionally an arrest of development will be limited to a lateral half of one jaw and the result is a very asymmetrical deformity (Fig. 59). The models were made from the denture of a boy nine years old and the oral deformity

was complicated by nasal obstruction (due to adenoids), impairment of the voice, mouth breathing, abnormal frenum of the upper lip and facial deformity.

In other instances both sides of the upper arch may be in complete linguoversion, but if provided with adequate treatment during the period of tooth eruption a normal development may readily be obtained. On the other hand, if treatment is not provided during the developmental period the arrest in development may become very marked and involve the jaw bones beyond the alveolar structures.

In Fig. 60 a rare form of transversion of the $|\overline{2,\ 3}$ is shown. The patient was a girl of sixteen years with normal general and oral health and the history entirely negative, except that her nasal passages had been treated by a rhinologist since her twelfth year. Her parents presented normal dentures, though a younger brother and sister have been under treatment for bilateral distoclusion. Each of the latter had an adenectomy performed before orthodontic treatment was instituted. An older brother and sister, on the other hand, have perfectly normal dentures.

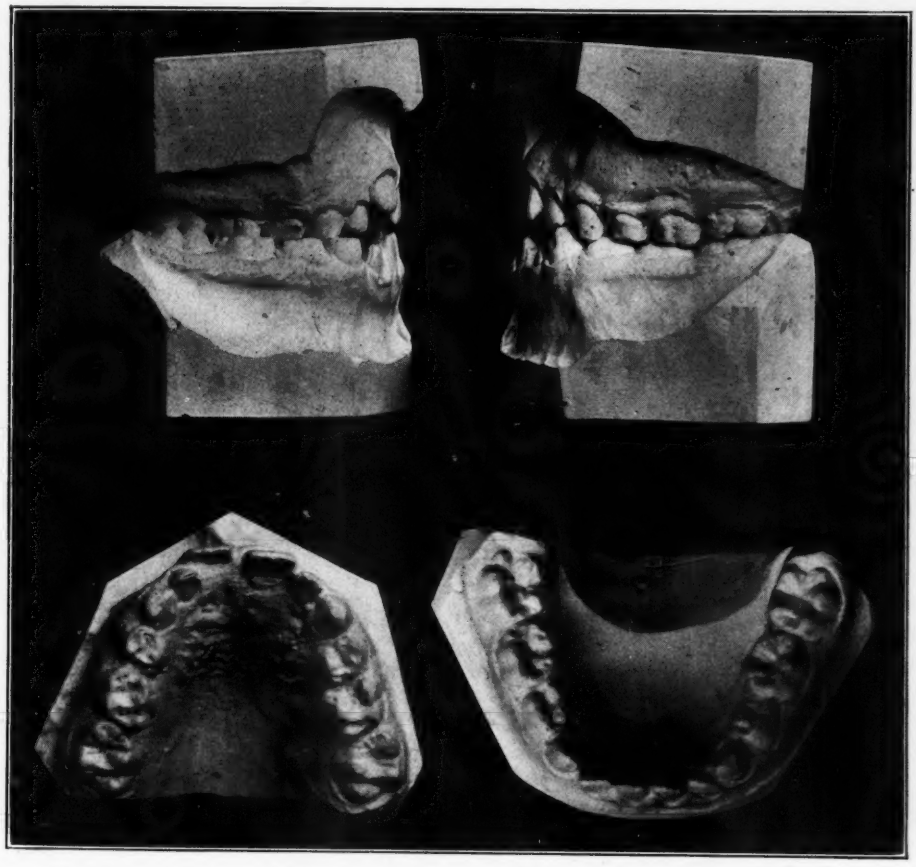

Fig. 59.—Neutroclusion complicated by linguoversion of 6, V, IV, III, II|.

Extreme malpositions like Fig. 60 cannot be adequately expressed by the terms mesioversion and distoversion, hence the term *transversion.*

(D) PRINCIPAL FACIAL TYPES OF NEUTROCLUSION.

As intimated in the beginning, the class of oral deformities under consider-

ation embraces a large variety of anomalous dental and facial types; and the abnormal facial features met with differ not only in the degree of their deformity, but also in kind. A further division is therefore eminently desirable, though in the present stage of our knowledge it can be only a very rough outline at best. If we had at least 1000 case histories compiled of each of the following types, we might then speak with a fair degree of authority. But since there are no such records in existence, the first step would seem to be to draught at least the first line of the chart. Furthermore, in all previous classifications and diagnostic terminologies the underlying structural changes and

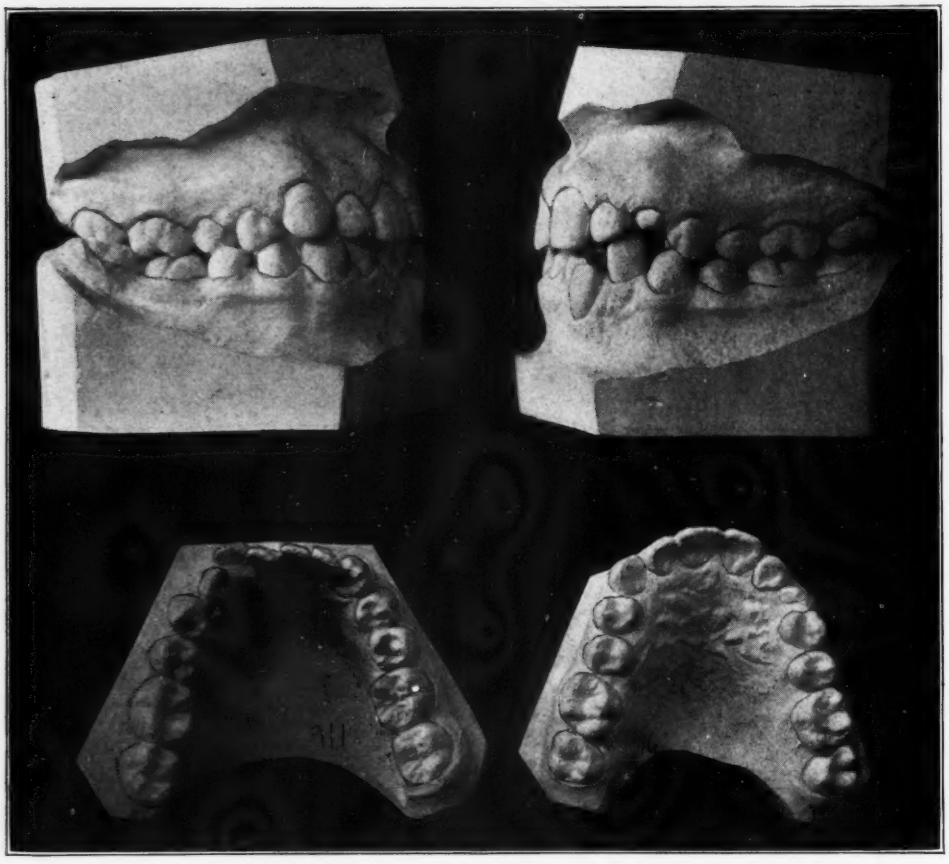

Fig. 60.—Neutroclusion complicated by transversion of $\overline{|2 \text{ and } 3}$.

disturbances of function were never sufficiently emphasized, which seriously hindered easy comprehension.

Neutroclusion complicated by linguoversion of the upper incisors is a common type (Fig. 61). The models were made from the denture of a boy eleven years old. His general health at that time was good, though the deciduous molars were extensively decayed. (These were extracted immediately after the impressions were taken.) As a child, he had contracted the usual infectious diseases like scarlet fever and diptheria, and at eight years adenoids were removed by a rhinologist.

The facial form of this case of malocclusion is shown in Fig. 62, which may well serve as a pattern, or archtype, because it is not extreme. The sunken

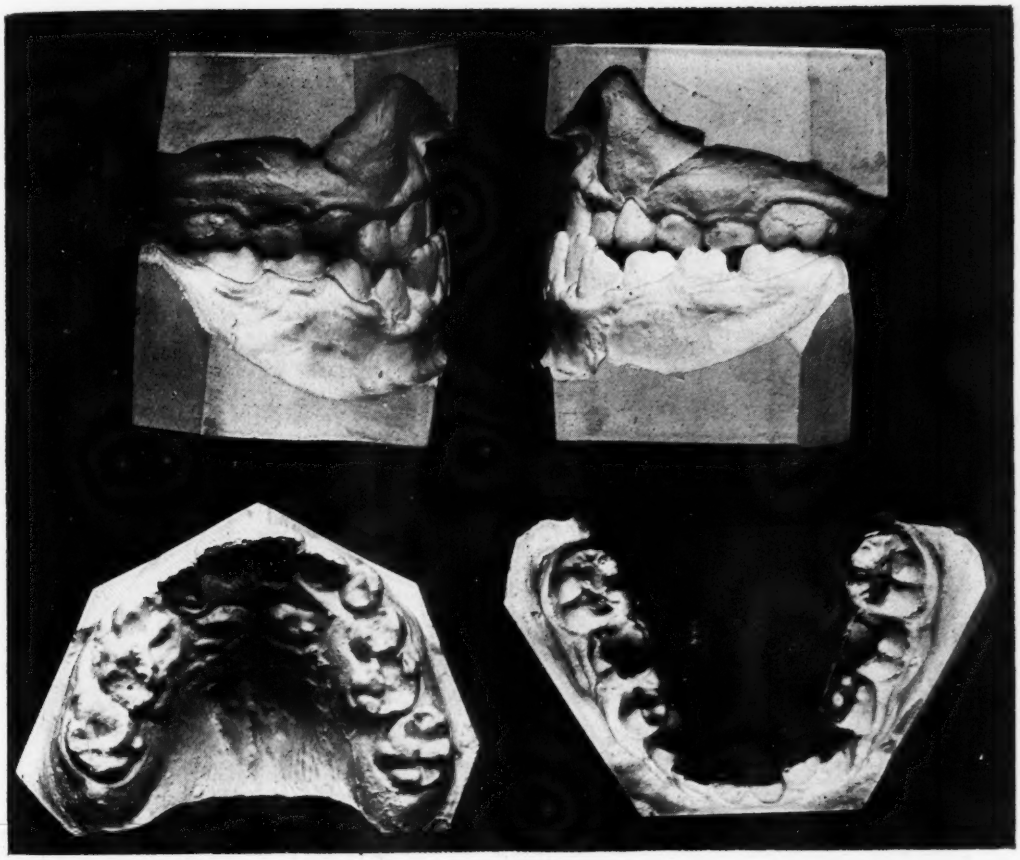

Fig. 61.—Neutroclusion complicated by linguoversion of the upper incisors, age eleven.

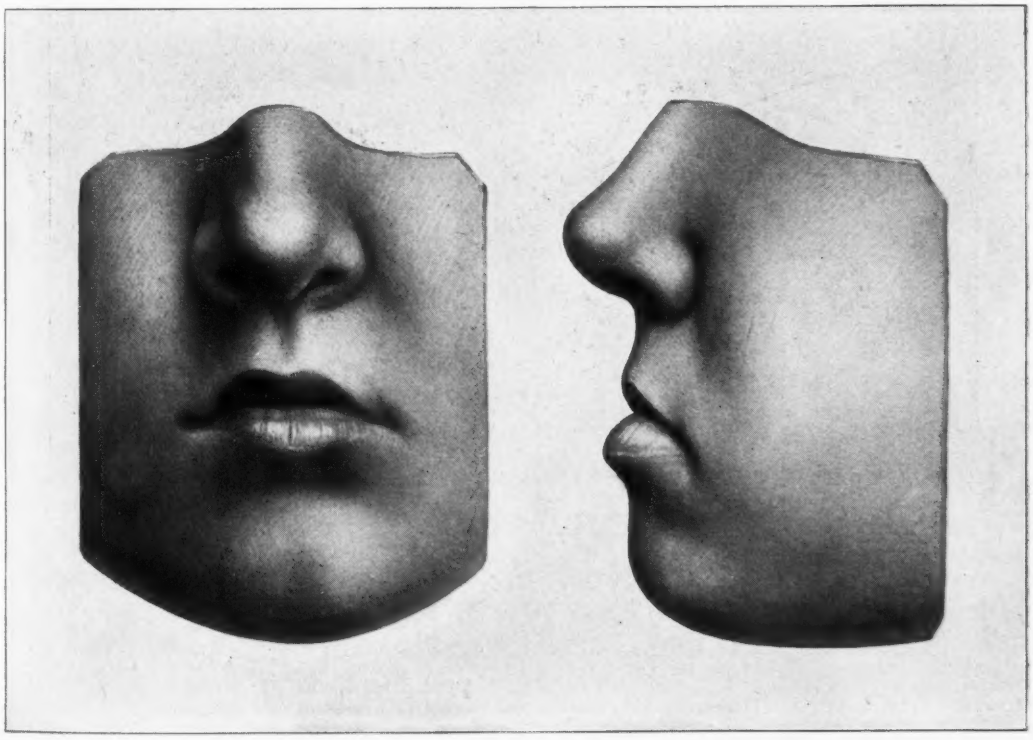

Fig. 62.—Facial deformity of case shown in Fig. 61.

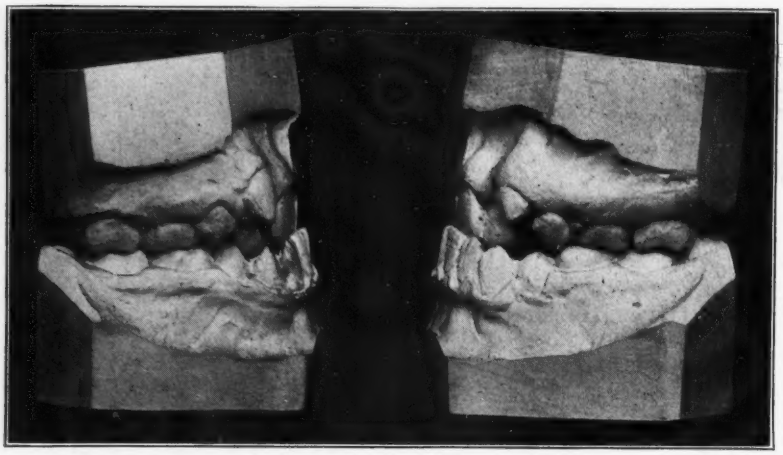

Fig. 63.—Same type as Figs. 61 and 62, age thirteen.

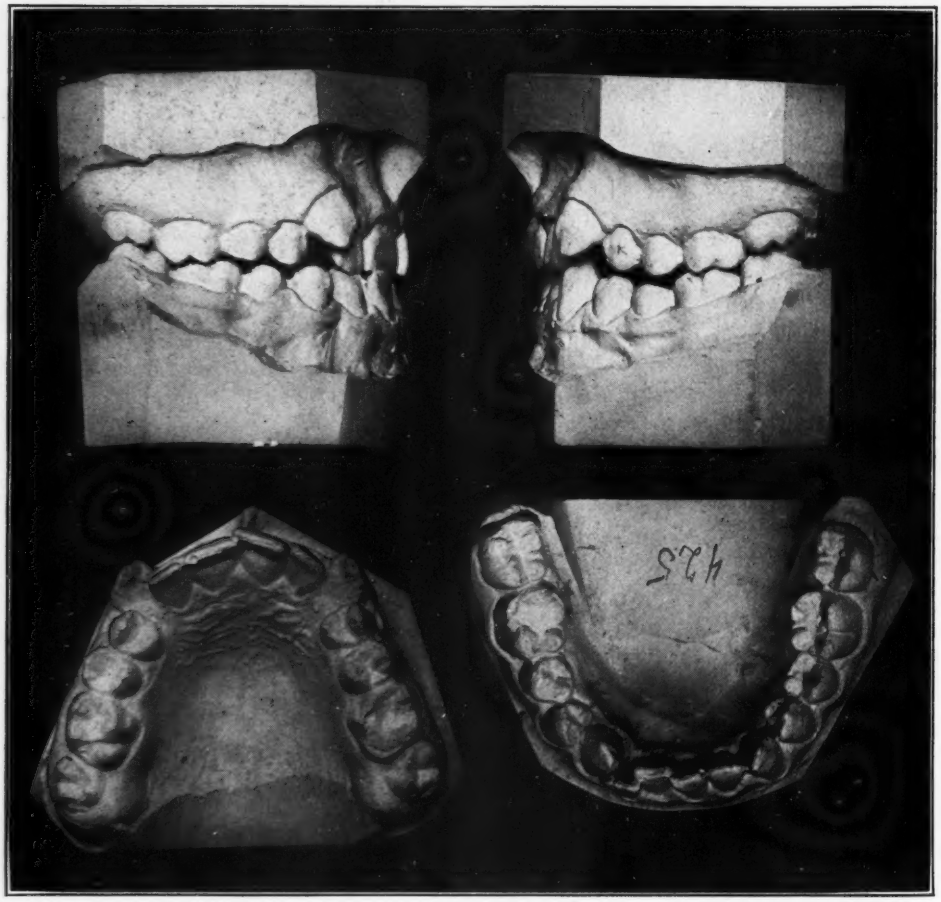

Fig. 64.—Neutroclusion complicated by linguoversion of the anterior teeth, age twelve.

naso-labial sulcus, owing to an arrest of development in the osseous structures underneath; the malposition of the angle of the mouth, the malrelation of the lips and their abnormal functions, which tend toward malformation; the flattened, straight upper lip, and seemingly prominent, large lower lip, are all readily recognized.

Malocclusions of this type usually present marked arrest of development in the intermaxillary bone, and the entire alveolar arch surrounding the upper teeth. Nasal obstruction is nearly always associated with this type and the impairment in the articulation is never entirely corrected by the rhinologist, no matter how successfully the adenectomy is performed. The effect in this respect of a successful orthodontic treatment is always gratifying.

There are many variations in the degree of deformity found in this type, as may readily be understood, but lack of space forbids our showing more than one other case (Fig. 63). The patient, a girl, was thirteen years old when the models were made and shows an advance in the number of permanent

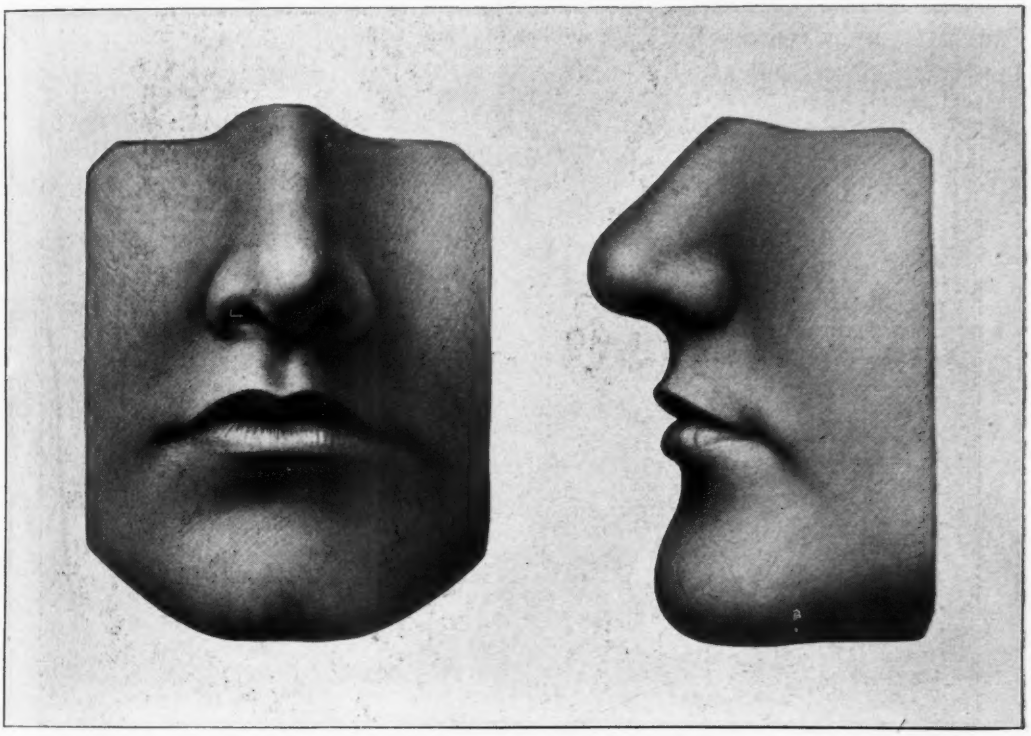

Fig. 65.—Facial deformity of case shown in Fig. 64.

teeth erupted at that time when compared with Fig. 61. Two more years of delay tell the same old story—conditions have become more complex.

For the benefit of beginners, who have not yet mastered orthodontic diagnosis, it may not be amiss to point out the similarity between the facial form of this type and that of *mesioclusion,* with which it is frequently confused.

Neutroclusion complicated by linguoversion of the anterior teeth (Fig. 64). The patient, a girl twelve years old, gave a negative history. There was no nasal obstruction present, and only a slight impairment of the voice was noticed. Several of the molar teeth have been affected by extensive caries, which was poorly treated with faulty fillings. A decided facial deformity was also present, as shown in Fig. 65. The bicuspids and first molars are in linguoversion and considerable arrest of development is evident in the alveolar process surrounding these teeth.

The facial deformity shown in Fig. 65 is typical of this group, which always exhibits a "sunken" or expressionless mouth. And in this particular case the chin, or symphysis, is unusually well developed, which at first gives one an impression of overdevelopment. But such is not the case because after correction (though the chin was not involved in the treatment) the facial expression was one of perfect harmony.

In Fig. 66 the models of a denture at nine years of age are shown which may serve as a type for an earlier stage of this deformity. This patient was an anemic girl, rather subnormal in development, but immune to caries. The

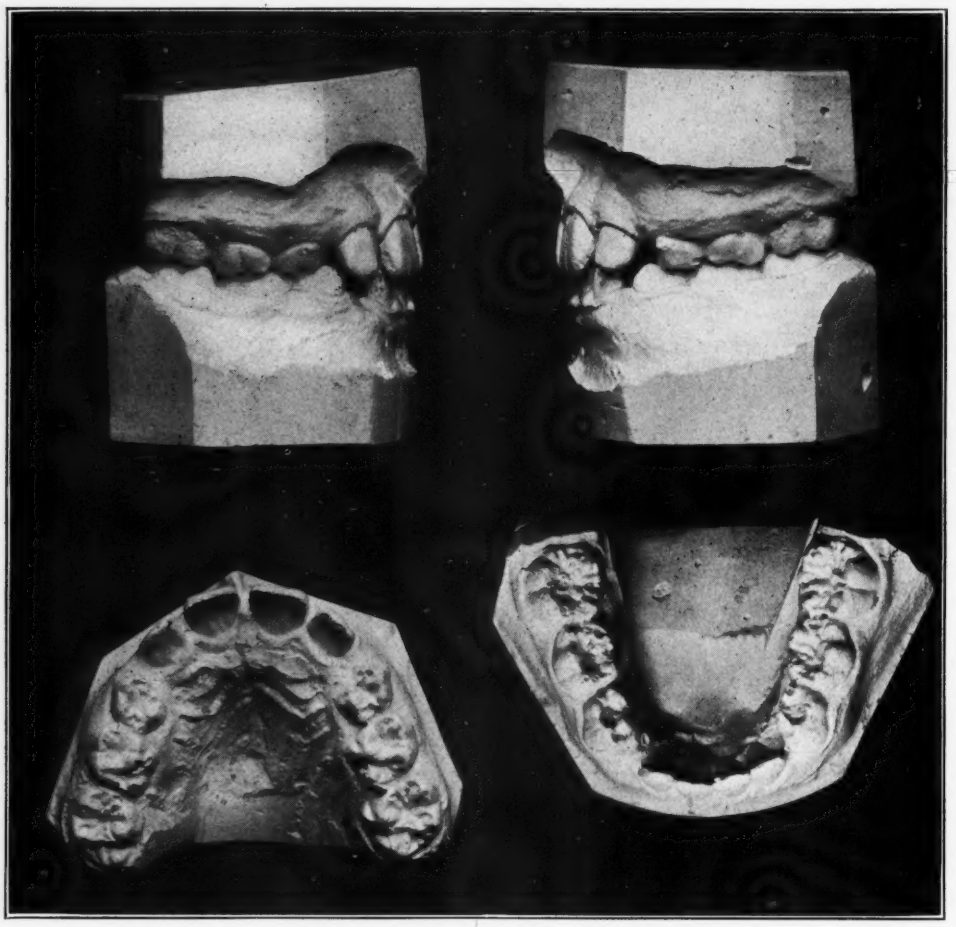

Fig. 66.—Same type as Fig. 64 at nine years.

linguoversion of all the incisors is clearly shown, as well as the partial obliteration of the spaces the permanent cuspids will require.

Neutroclusion complicated by labioversion of the upper incisors is probably the most common form of facial deformity found in this class. Fig. 67 shows an extreme case of this type at sixteen years. The patient was a miss who had always had access to the best dental service and had also been in the care of a competent orthodontist for five years. She was of a nervous temperament and had acquired the pernicious habit of biting the lower lip. This undoubtedly was largely responsible for the extreme labioversion of the upper incisors and

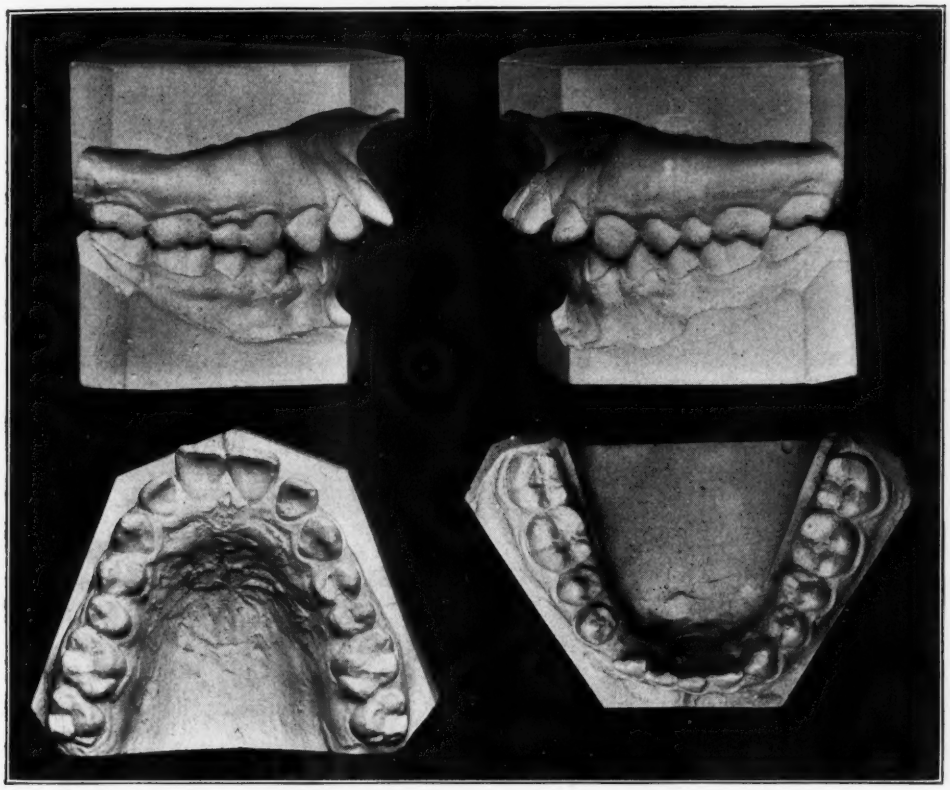

Fig. 67.—Neutroclusion complicated by labioversion of the upper incisors, female, age sixteen.

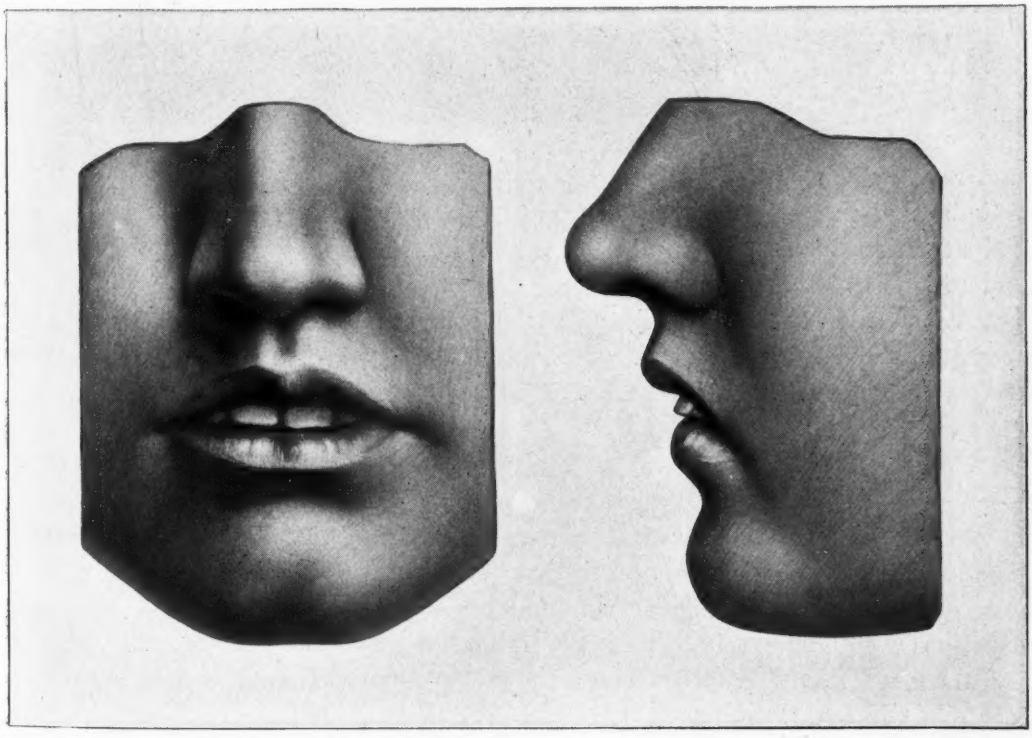

Fig. 68.—Facial deformity of case shown in Fig. 67.

linguoversion of the lower. The latter were readily involved because of the break in the continuity of the lower arch caused by deficiency of number in the lower right cuspid. The intermaxillary bone was arrested in development, the upper incisors occupied an extremely oblique position, the voice was impaired and the facial deformity was considerable (Fig. 68). The form, functions and relations of the lips were all abnormal.

Thumbsucking, nasal obstruction, the prolonged use of pacifiers, and lip biting are believed to be causative factors in these cases. Fig. 69, made from a boy nine years old, shows this type at an earlier period.

In Figs. 70 and 71 longitudinal sections of the normal mouth are shown which illustrate the form and function of all the structural elements, especially of the teeth and closely related tissues. Special attention is called to the perfect adaptation of the dorsum of the tongue to the vault of the palate. In Figs. 72 and 73 similar sections of the abnormal mouth of the type under consideration are shown, which illustrate the perverted form and function and

Fig. 69.—Same type as Fig. 67 at nine years.

maladaptation of the teeth, lips, tongue and other contiguous structures. Special attention is directed to the abnormal functions and relations of the lips and tongue.

When we ponder the injury to the individual suffering from such malformations during the tender, developmental period of life, and reflect over their relative frequency, we feel impelled to urge the most painstaking investigations.

Neutroclusion complicated by infraversion of the anterior teeth (Fig. 74) is a form of abnormality of rather infrequent occurrence; but infraversion is a complication found in all classes of malocclusion. The models shown in the illustration were made from the teeth of a girl sixteen years old. The patient was referred by a rhinologist who had recently removed adenoids from her nasal passages. Her speech was very much impaired and she presented an unusually large tongue, which she was in the habit of "nursing." Hypertrophied turbinates, mouthbreathing and an enlarged uvula were also present, though her general and oral health was good. The alveolar process and the support-

Fig. 70.—Longitudinal section of a normal mouth.

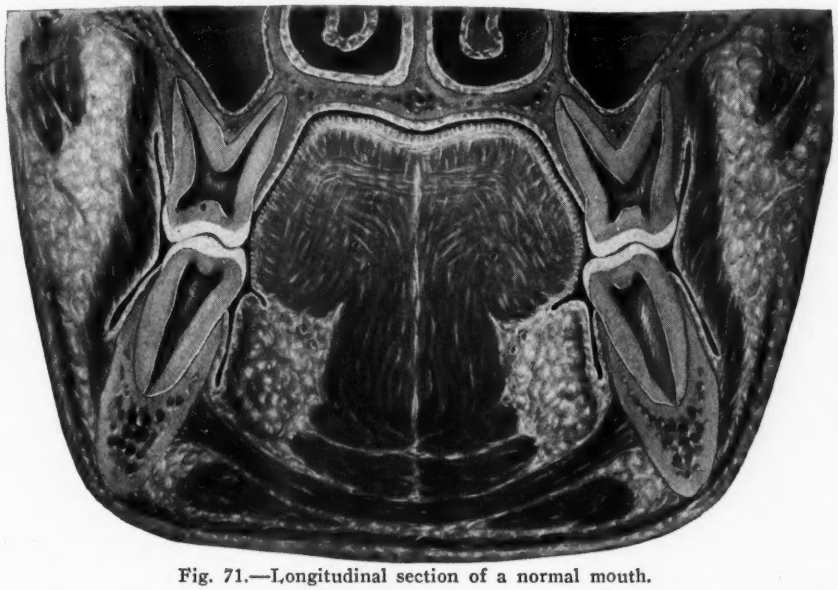

Fig. 71.—Longitudinal section of a normal mouth.

ing osseous structures beyond are poorly developed in these cases. The facial expression is indicated in Fig. 75.

Neutroclusion complicated by labioversion of the upper and lower anterior teeth constitutes another, though very rare, variation, Fig. 76. Indeed it is an open question in these cases whether it is merely a labioversion of the anterior teeth, an arrest of development in both jaws (micrognathia), or an overdevelop-

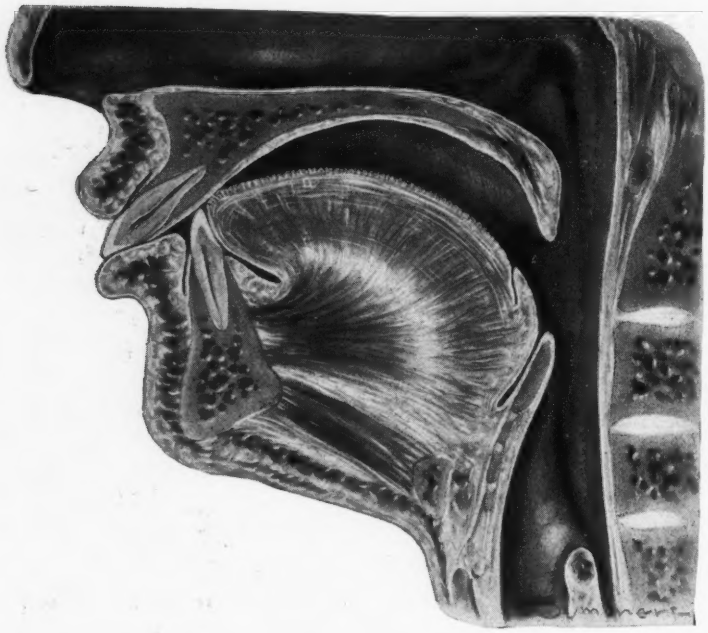

Fig. 72.—Longitudinal section of a case of neutroculsion complicated by labioversion of the upper incisors.

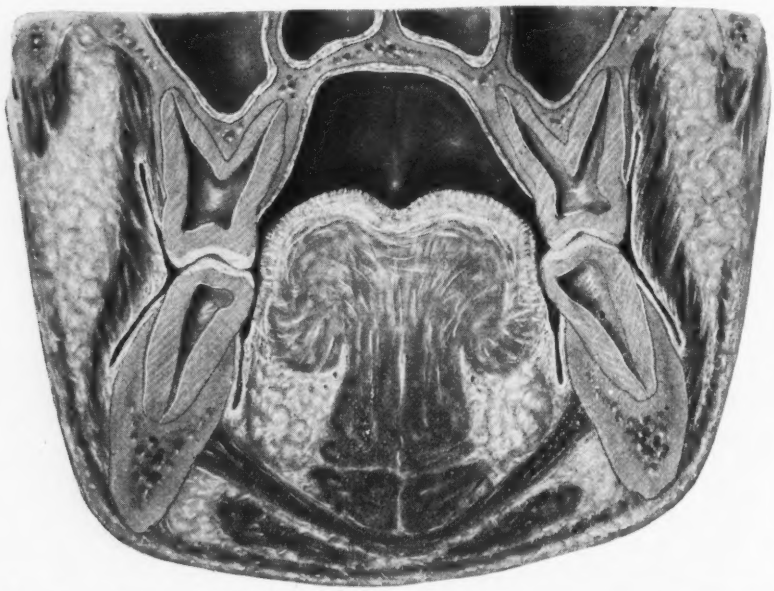

Fig. 73.—Longitudinal section showing arrest of development in malocclusion.

ment in the size of the teeth (macrodontia), or a combination of these. More extreme conditions of this type will be shown in a subsequent number.

(E) CLINICAL SUMMARY.

SIMPLE NEUTROCLUSION.—*Etiology*:—Faulty diet, dental caries, premature loss of teeth, prolonged retention of temporary and supernumerary teeth, nasal stenosis, habits, traumatism, abnormal frena of the lips, idiopathic.

Pathology.—Malposition and malocclusion of the teeth, abnormal arch-

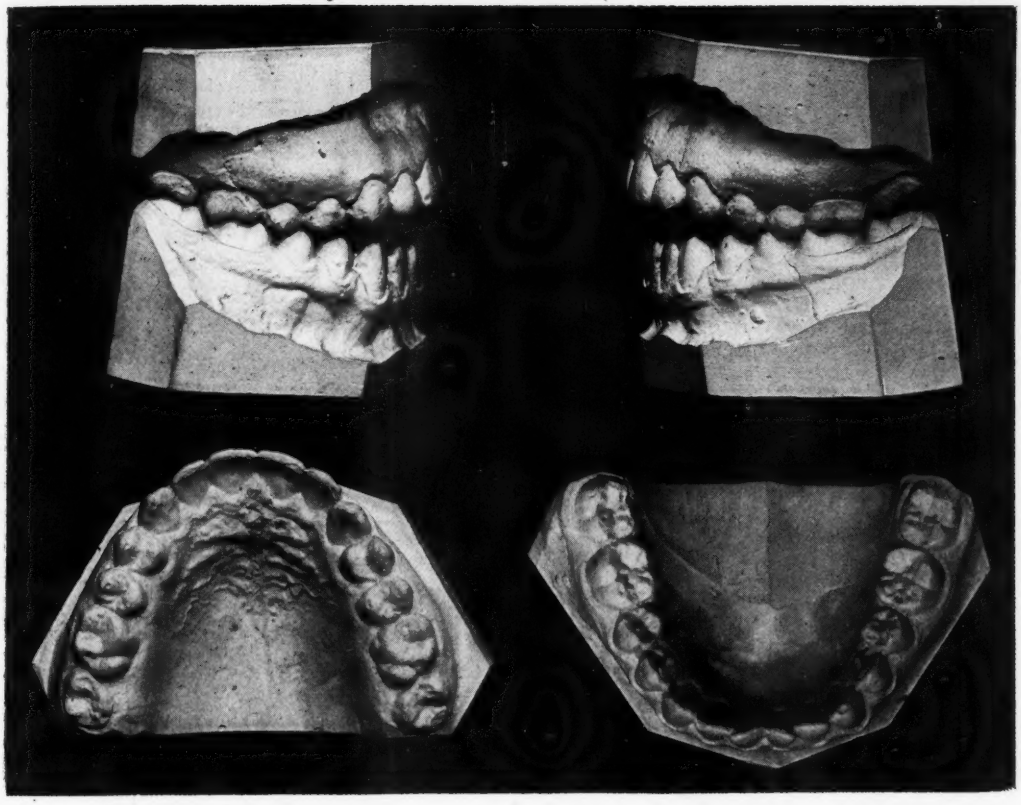

Fig 74.—Neutroclusion complicated by infraversion of the anterior teeth, age sixteen.

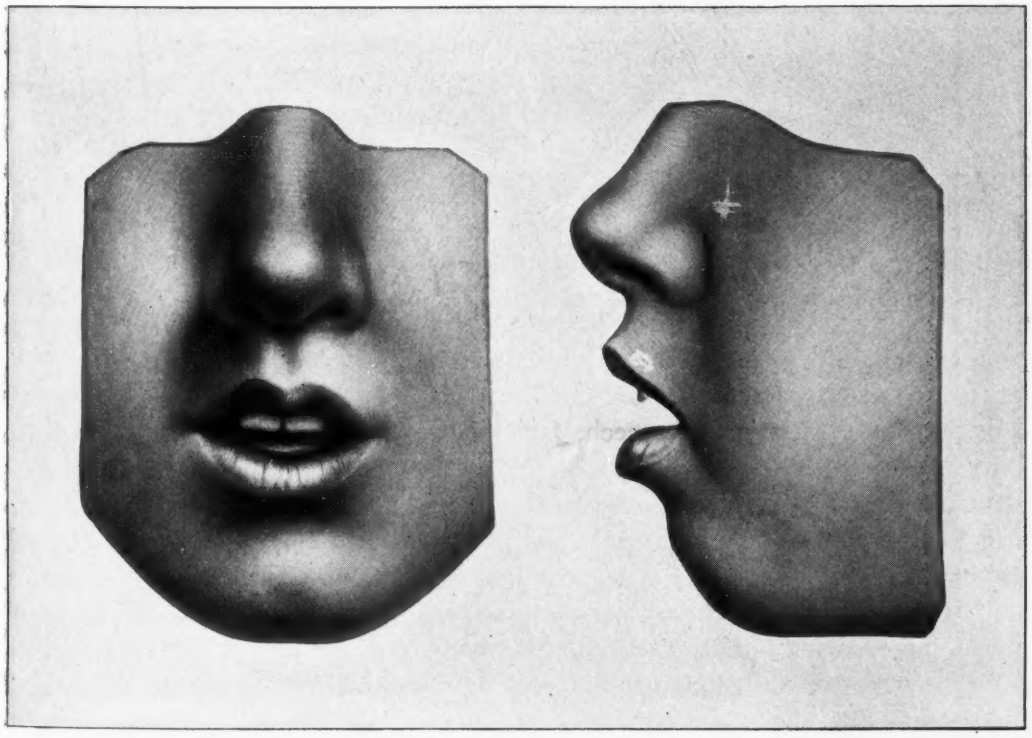

Fig. 75.—Facial deformity of neutroclusion complicated by infraversion of anterior teeth.

form, maldevelopment of the alveolar process, abnormal frena of the lips, anomalies of eruption, dental caries, nasal stenosis.

Prognosis.—Rarely favorable, depending on etiology and pathology; general tendency in most instances toward complications. Occasionally, postponement of treatment to ninth year permissible, but observation and control during the interim always advisable.

COMPLEX NEUTROCLUSION.—*Etiology.*—Faulty diet, dental caries, premature loss of teeth, prolonged retention of temporary and supernumerary teeth, nasal stenosis, habits, traumatism, anomalies of number, form and eruption of the teeth, idiopathic.

Pathology.—Malposition and malocclusion of the teeth, abnormal arch-

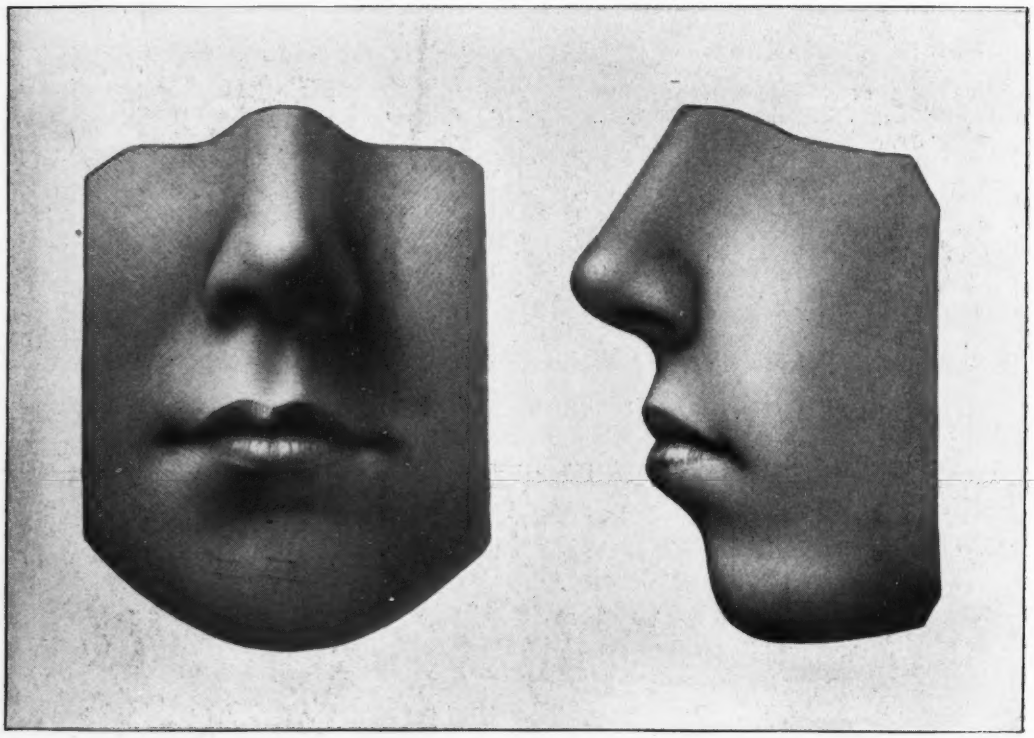

Fig. 76.—Facial type of neutroclusion complicated by labioversion of the upper and lower anterior teeth.

form, maldevelopment of the alveolar process, abnormal frena of the lips, anomalies of eruption, form and number of the teeth, dental caries, nasal stenosis, faulty articulation in speech, facial deformity.

Prognosis.—Always unfavorable, progressive, with frequent marked tendencies toward serious malformations of the osseous and facial structures; early treatment always advisable; postponement beyond the twelfth year extremely hazardous.

In conclusion, the author wishes to remind the reader that not all the complications of neutroclusion met with in practice are included above, but enough have been shown to emphasize the need of a rational, flexible terminology and to demonstrate the utter inadequacy of numerals. We need terms that will serve as guide posts to the imagination, that will promote easy comprehension

and thus elaborate thoughts, ideas, and feelings. In fine, the subject matter of the art and science of orthodontics is more than mere mechanics and malocclusion of the teeth. Dentofacial deformities constitute a large group of malformations due to errors of development, whose etiology, prognosis, pathological anatomy and pathological physiology are as yet very imperfectly understood. And though we revere the many contributions of the pioneers on this subject, we are not unmindful of present duties, or of the greater tasks in the future. All that has thus far been accomplished is but a faint beginning, a ray of light on the eastern hills of the dawn.

(To be continued.)

HISTOLOGICAL STUDIES OF THE DEVELOPMENT OF THE CEMENTUM OF THE ROOT OF THE TOOTH OF YOUNG RHESUS MONKEYS

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ON making an examination of the literature relative to the origin of the cementum of the root of the tooth, we learn that the present teaching is that this tissue is laid down on the root of the tooth by the alveolar dental ligament. If the development of the cementum were dependent on the alveolar dental ligament, we would find in the substance of the fibrous capsule (which eventually becomes the alveolar dental ligament) in the immediate vicinity of its contact with the developing root of the tooth which it surrounds, cells or groups of cells which morphologically correspond to the cemental cells found in the apical area of the developing root in which the odontoblasts are commencing to arrange themselves. The alveolar dental ligament histologically is the same as the periosteum. The periosteum has by recent investigation been proved a limiting membrane for the growth of the bone; likewise, the author believes the alveolar dental ligament is a limiting membrane for the growth of the cementum. In a recent paper by the author, published in the *International Journal of Orthodontia, Vol. II., No.* 10, entitled, "Histological Studies of the Development of the Alveolus of Young Rhesus Monkeys," the present teaching that the development of the alveolus is dependent on the periosteum is not substantiated.

In this paper the author will endeavor to show that the cementum is not laid down on the root of the tooth by the fibrous capsule which surrounds the developing root of the tooth, but instead, that this tissue is laid down by the tooth pulp.

A study of slides made from the mandible and the maxillæ of young rhesus monkeys present microscopic evidence which does not coincide with the present teaching. But instead shows that cementum of the root of the tooth

is laid down by the tooth pulp before the dentine is laid down. To present this evidence the author has made photomicrographs from the slides studied, which will be explained histologically.

Let us now commence a study of the photomicrographs. The first picture

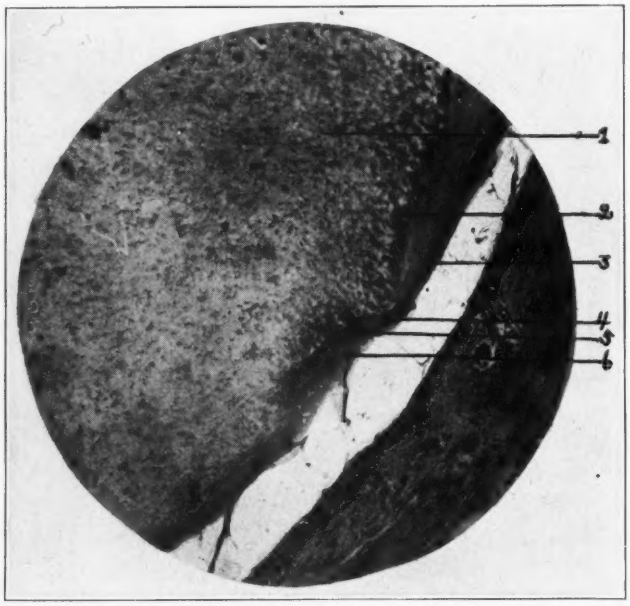

Fig. 1.—A low power picture at the apical area of the developing root of the young rhesus monkey.

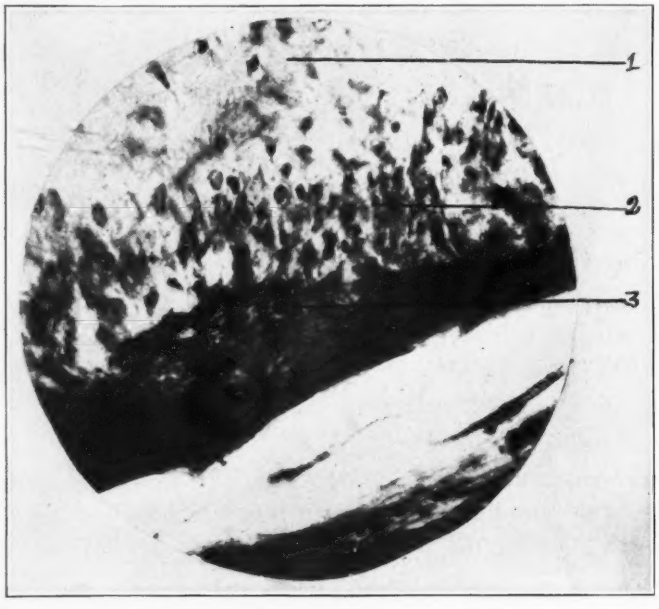

Fig. 2.—Showing a higher magnification of an area in the same field as Fig. 1.

shown is the low magnification of the developing root near the apical area. Beginning at 1, which is the tooth pulp of the developing root of the tooth, advancing to 2, we observe the odontoblasts. At 3 is shown a space in which small cells are present. These cells are the cemental cells: continuing to 4,

we note that the dentine is now absent and that the odontoblasts are commencing to take their typical arrangement. At 5 is shown the cemental area. The cemental cells are faintly shown. Directly below 5 is shown the fibrous capsule, 6, which surrounds the developing root of the tooth.

The layer of cemental cells shown at 5 is termed by the author, the basel layer of the cementum, and it is from this layer that the future cemental lamellæ develop. The fibers of the fibrous capsule at this time of the development of the root of the tooth run parallel to it. If the cementum had its origin in the fibrous capsule there would be present in its substance in the immediate vicinity of its point of contact with the tooth, cells which morphologically are the same as the cells noted at 5. The evidence presented by this picture refutes the present teaching, as to the origin of the cementum. The next picture (Fig. 2) is a higher magnification of an area in the same field as shown in

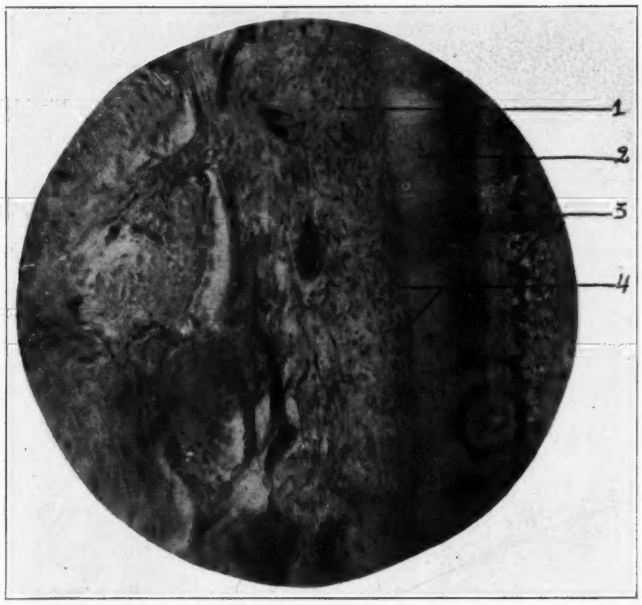

Fig. 3.—Low power magnification of the developing root near the point of bifurcation.

Fig. 1. Beginning at 1, which is the tooth pulp, advance to 2, at which point the odontoblasts are shown. Directly below the odontoblasts at 3 is shown the cemental area of the developing root of the tooth. The upper portion of the cemental area is very dense, this density being caused by the cemental cells.

Directly opposite the end of the pointing line for this area, one will, on careful examination, observe a cemental cell. Comparing the cell thus shown to the odontoblasts and mentally to the fibroblast, one finds that this cell morphologically does not correspond to either of the foregoing cells. Again we have evidence which does not coincide with the present teaching as to the origin of the cementum of the root of the tooth.

In the next picture (Fig. 3) is shown an area of a developing root a short distance below the point of bifurcation. At 1 is shown the fibrous capsule which surrounds the developing root of the tooth; at 2, the dentine; at 3, the odontoblasts; and at 4, the cemental cells. Careful examination of the picture

shows that the cemental cells are more numerous below the pointing line than above it. The cemental cells, although not shown in contrast are sharp enough in outline to be easily distinguished from the fibroblasts in the substance of the

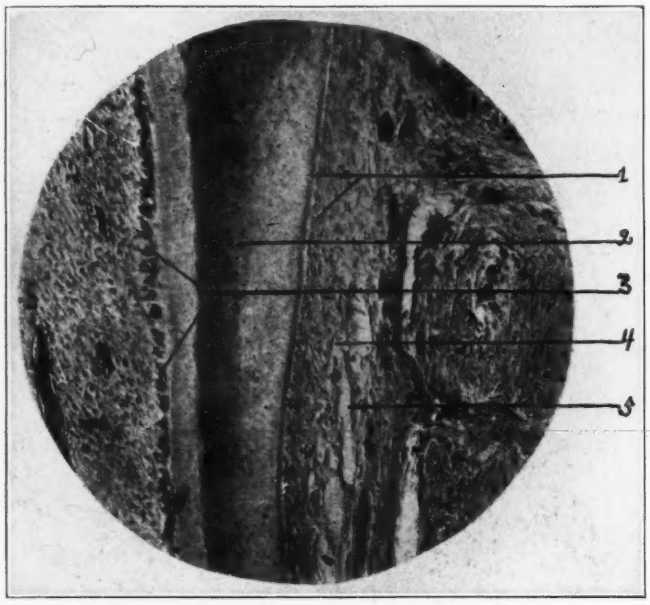

Fig. 4.—Showing a low magnification of the buccal surface midway between the apical and gingival areas.

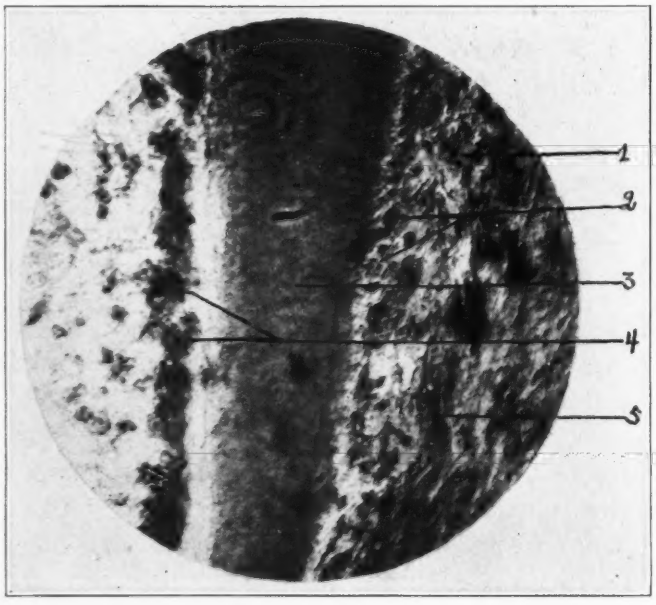

Fig. 5.—Showing a high magnification of an area in the same field as Fig. 4.

fibrous capsule. This picture shows that the cemental cells are not of a uniform size or shape but that they are laid down in layers or lamellæ at this time in the development of the root of the tooth.

The fibers of the fibrous capsule in this picture do not show any attach-

ment with the cementum of the root of the tooth. If the fibrous capsule were concerned in the development of the cementum, we would find in its substance in the immediate vicinity of its point of contact with the cemental area cells

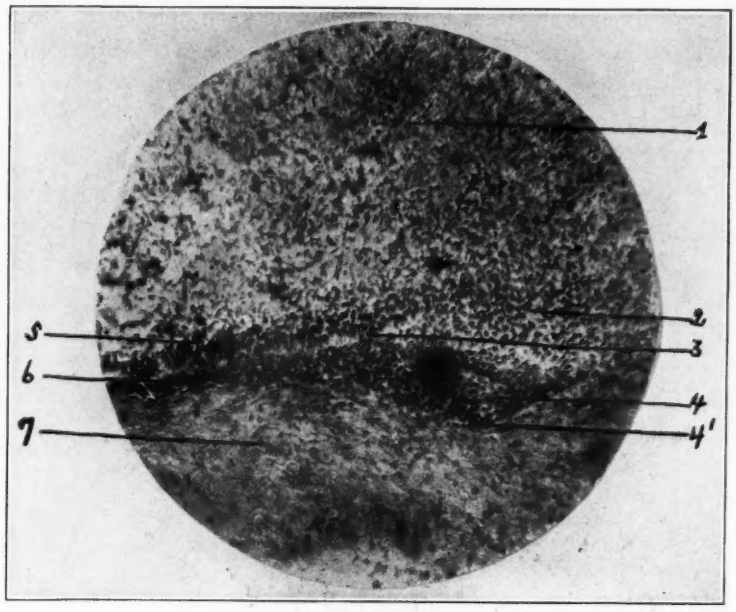

Fig. 6.—Showing a higher magnification of an area at the extreme apical portion of a developing root.

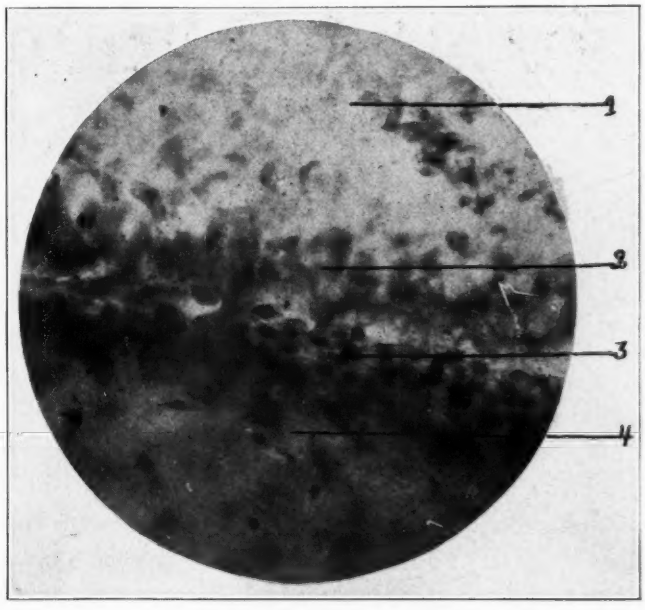

Fig. 7.—Showing a higher magnification of an area from the same field as shown in Fig. 6.

which morphologically correspond to the cemental cells found near the dentine. We would also find that some cells, cemental in type would be found between fibers which had partially attached themselves to the root of the tooth. The evidence presented by this picture is directly against the present teaching.

The next picture (Fig. 4) is the buccal surface of the developing root of the tooth and is taken midway between the apical area and the gingival area. Beginning at 1, we observe the cemental cells: their arrangement is not regular, nor are they uniform in shape and in size. Only one layer of the cemental cells is shown in this picture. The reason that no more are shown is that no two layers are in the same plane when the fine adjustment of the microscope is employed. Hence the reason why only one layer or lamellæ of cemental cells is shown.

At 2 is shown the dentine; at 3, the odontoblasts; and at 4, the fibrous capsule which is cut longitudinally. In this picture we also observe that the fibers of the fibrous capsules are running parallel to the long axis of the developing root, no attachment of the fibers of the fibrous capsule being apparent.

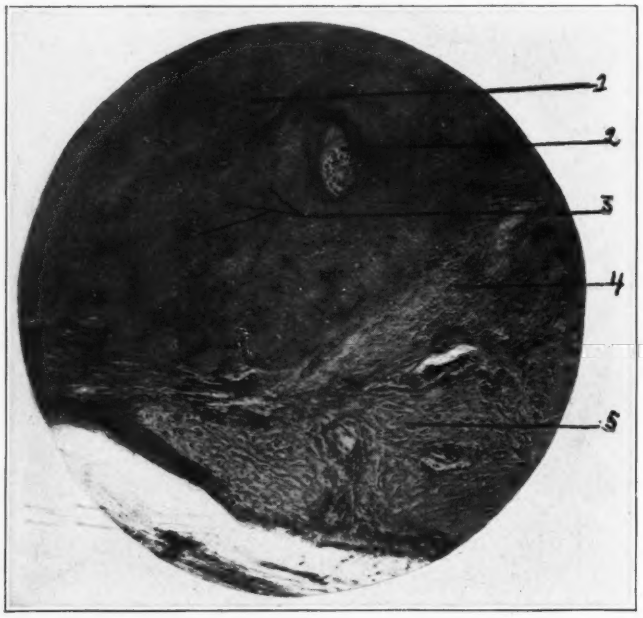

Fig. 8.—Showing a canal in the substance of the cementum of the deciduous tooth of the rhesus monkey which the author believes is an Haversian canal.

The next picture (Fig. 5) is a higher magnification of an area of the same field as shown in Fig. 4. Beginning at 1 is shown the fibrous capsule; at 2, the cemental cells; and at 3, the dentine. On careful examination of the cemental border of the dentine we note that it is very rough and irregular in outline, and that the cemental cells are in close contact with the dentine. Continuing towards 4 we note the odontoblasts, and at 5 is shown the fibroblasts of the fibrous capsule.

This picture shows that the general direction of the fibrous capsule surrounding the developing root of the tooth is parallel to the long axis of the root. In this picture we are offered an excellent opportunity to study morphology of the cementum cell and the fibroblast. The cemental cell, we observe, is round at this time of the development of the root while the fibroblast is an elongated cell, the ends of which are tapered to a point, while the middle of

the cell is bulged. No apparent attachment of the fibers of the fibrous capsule to the root of the tooth is noticed.

The next picture (Fig. 6) is a low power picture taken from the extreme apical area of the developing root of the tooth. Beginning at 1, which is the tooth pulp, and advancing to 2, we at once note that the cells in the area indicated by the pointing line show that they are commencing to take on the arrangement of the odontoblast. At 3, the cells have now taken on a perpendicular position. At 4, we note that the arrangement of the cells is not the same as observed at 3, and further, that the cells are of a different kind than shown at 3. At 4, we note that the cells have now taken on a definite arrangement which is in layers or lamellæ. Further study shows that the cells are morphologically different. The cemental cells being round while the odontoblasts are cylindrically shaped. One can by careful observation trace

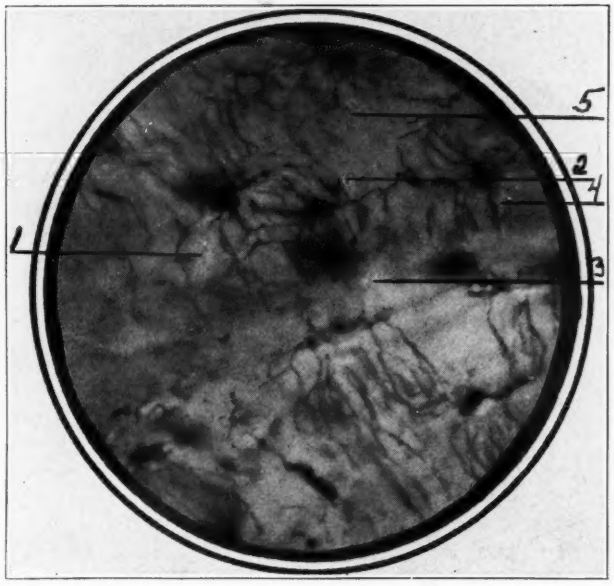

Fig. 9.—Showing lacunæ and canaliculæ of bone.

the transitional changes in shape and position, the odontoblasts, and the cemental cells, if one begins at 3 and advances towards 5 for the odontoblasts, and from 4 to 4′ to 6 for the cemental cells. At 5, are shown the odontoblasts and in this area they have taken their typical position. At 6, we observe the lamellæ of the cementum, and on comparison, we learn that the cemental cells are round, while the odontoblasts are cylindrical in shape. At 7, is shown the fibrous capsule which surrounds the developing root of the tooth. With this picture one is able to trace the transitional changes of the tooth pulp cell to the cemental cell and the odontoblast, and further one is able to show that the cemental cell is laid down before the odontoblast is at 4 and 4′, in which area the odontoblasts are just beginning to arrange themselves while the cemental show their position very distinctly.

The next picture (Fig. 7) is a high magnification of an area of the same field as shown by Fig. 6. Beginning at 1, which is the tooth pulp, advance to

2, which shows the odontoblasts. At 3, is shown the cemental area. In this area we observe that the cemental cells are laid down in lamellæ. At 4, is shown the fibrous capsule. In this picture we have further evidence that the cementum of the root of the tooth is laid down by tooth pulp.

In the next photograph (Fig. 8) is shown an area from the deciduous root in the rhesus monkey. The cementum of the root of the tooth is shown at 1. At 2 is shown a canal in the substance of the cementum which has a definite circumscribed wall and around this canal we find cemental lacunas, 3. The author has in his collection of slides a section from a human tooth in which there is also shown a canal in the substance of the cementum. The question which now arises is: "Why is it that these canals are not constantly found in the cementum?" The question can be answered as follows: In the process of embedding and placing the specimen to be cut, the angle of

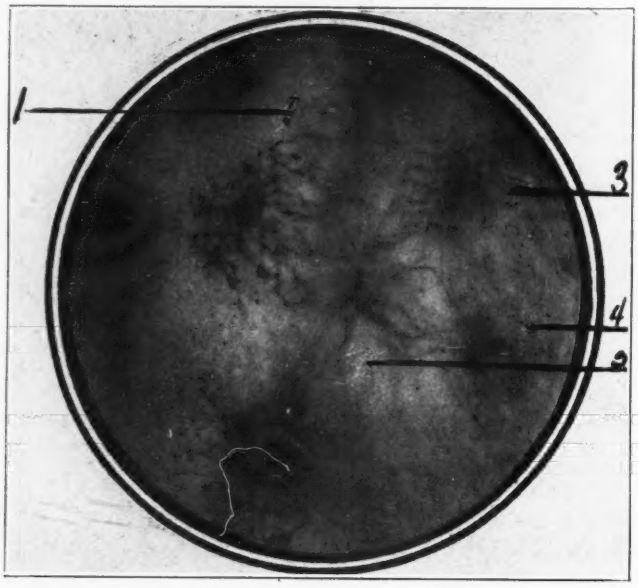

Fig. 10.—Showing the lacunæ and canaliculæ of the cementum.

the specimen is such that the canals contained in the cementum are not in the plane of the specimen and, therefore, are not found. One cannot deny that the canal shown in this picture is not a nutrient canal of the cementum. This being the case we are compelled to admit that the canal shown is an Haversian canal, and with this admission we are compelled to admit that the cementum found around the root of a tooth is true bone. At 4 is shown the alveolar dental ligament, and at 5 the alveolus.

Fig. 9 is shown a high magnification of bone showing the lacunæ and the canaliculæ. Careful examination of this picture shows that the lucanæ and canaliculæ, 1, 2, 3, 4, and 5, all communicate with each other.

Fig. 10 shows a highly magnified area of the cementum of the root of the tooth. In this picture it is clearly shown that the lacunæ and the canaliculæ of the cementum, 1, 2, 3, and 4, all communicate with each other. Morphologically the cells of the cementum and of the bone are the same.

The evidence thus presented by the foregoing photomicrographs does not coincide with the present teaching that the cementum is laid down on the root of the tooth by the alveolar dental ligament, but instead, proves that this limited bony covering is developed from the tooth pulp before the dentine is laid down. Further, this limited bony covering of the root of the tooth histologically at high magnifications shows that the lacunæ of the cementum and of the bone are morphologically the same, and that the bony covering of the root of the tooth is true bone because of the presence of a canal contained in its substance which the author believes is a nutrient canal and, therefore, an Haversian canal.

THE HISTORY OF ORTHODONTIA

By Bernhard Wolf Weinberger, D.D.S., New York City.

(*Continued from page 571.*)

E. *BAKER,* in an article on *"The Use of India Rubber in Regulating Teeth," New York Dental Recorder,* Sept., 1846, page 15, says:

"Apparently there is no portion of the human system, which is subject to so much irregularity and sometimes deformity, as the teeth.

"It would undoubtedly be interesting to search, if possible, into the arcana of nature, and trace by what phenomena, or laws of physiology, there is such a variety of classes of irregularity in this respect, or to consider what effect civilization has had in contributing to it. Irregularity of teeth rarely or never occurs in savage, or semi-civilized life,—so it may be said of the brute creation.

"There is frequently a disproportion between the aggregate size of the teeth and the capacity of the jaw for their regular accommodation. No doubt a contraction of the jaw may be produced by the frequent and injudicious practice of prematurely extracting the deciduous teeth of children.

"The age of twelve years is generally recommended as the proper time to rectify irregularities in the permanent teeth.

"Due care should be taken that the superior and inferior dental arches should be preserved in their proper relative positions. As a general rule, when there is irregularity in the upper, there also is in the under teeth, and the regulating of both may be accomplished at the same time.

"What are the best means for bringing irregular teeth into their desired position, when traction or force is necessary in order to accomplish it? In reasoning on the subject, the question will naturally occur,—what application to a tooth will be most likely (there being room) to bring it to the particular and desired position? The answer will be, that power which is so applied as to draw the tooth directly and continually towards the position you wish it to occupy.

"A very slight continued pressure will be sufficient to regulate the teeth of young persons while the processes are comparatively soft and yielding.

"Caoutchouc, elastic gum, or India rubber, is admirably calculated to produce the desired effect in regulating teeth.

"No substance is yet known which is so pliable and at the same time so

elastic; and it is further a matter of curiosity, being capable of resisting the action of very powerful menstrua or solvents. Its solidity, flexibility and elasticity, and its quality of resisting the action of aqueous, spiritous, saline, oily, and other common solvents, render it extremely fit for the construction of tubes, catheters, ligatures and other instruments in which these properties are wanted.

"A narrow strip should be cut from a thin sheet of the India rubber, and after extending it to nearly its utmost capacity, without breaking, it should be fastened to the tooth to be regulated, and then be passed outside, or inside, as the case may require, of the tooth next to the one to be regulated, and which serves as a fulcrum, to draw or tract the irregular tooth to its proper position.

"Secondly, the ligature must be alternately shifted, when possible, to teeth each side of the irregular ones, but continually attached to the ones to be regulated, and for reasons which need no explanation. Thirdly, it should be so fastened to the teeth, as to do the least possible injury to the gums; and finally, it is generally necessary to have also a ligature fastened to the teeth in the opposite jaw, in order to rectify a corresponding irregularity frequently happening to the antagonistic teeth, or at any rate, to facilitate the operation on those teeth most out of place."

M. P. A. Grandhomme, a Frenchman, in an article in the *New York Dental Recorder,* November, 1846, page 29, entitled, *"Reflections Upon the Methods Made Use of at the Present Time for the Regulating of the Teeth, Followed by a Description of a New Process"* (translated by E. Baker), says:—

"First, on the means employed to the present day for the (reduction) regulating of teeth.

"The teeth, frequently, instead of rising vertically from the alveolar border, incline sometimes in variable angles, forwards, backwards, or sideways, so as to present the deformities, known under the names of anterior, posterior lateral obliquities, or obliquities, complicated or not with a movement of rotation on their axis.

"Praiseworthy efforts have been tried, with various success, to remedy these deviations and constitute thus a true dental orthopedy; but the results obtained to this time, have not been realized to the perfection desired and we have been left to deplore the insufficiency of our art, as it respects the correcting the irregularities of dentition.

"In alluding to the practice of the reduction of the irregularities of dentition, I introduce, with some confidence, a new process founded on the most rational theories, and sanctioned besides by an experience of many years, a process at once more powerful and more sure than any means made use of up to the present time.

"I propose to offer a few reflections, tending to show the inadequacy and imperfection of the means for this purpose, formerly made use of, which were:

"Sudden and instantaneous reduction, slow and gradual reduction.

"These are the two heads under which can be classed all operations, which are recommended, and commonly practiced for remedying the (obliquities) irregularities of the teeth, and of which we are going to make a most brief review, as our only object is (we do not conceal it), to prove their imperfections.

"First.—Instantaneous reduction, which is performed by the single process

of luxation, which I cite with regret, and which I shall not take the trouble of describing. The dangers to which such a process is liable render all criticism of it superfluous.

"Second.—Gradual reduction. It is to produce this that all the means generally employed, and also that which I propose to substitute, tend. This last is performed by two different methods, viz., traction and forcing back."

Although his work is interesting we gain little that is new, in that he was opposed to the methods then in practice, condemning all methods that were in use at that time, and advocating nothing that was new. He made use of caoutchouc, a material he says he was the first to introduce to the profession.

The apparatus used and described by him was a "band consisting of a narrow metallic plate fixed at its extremities to the molar teeth, by means of hooks and ligatures, and bent over the dental arch, passing over the dental obliquity; forming thus, a kind of bridge. Holes are pierced through the band opposite to the irregular tooth, and through them a ligature is attached to it: viz., the tooth, and renewed or tightened once in three or four days.

"The band then, ought to be classed among the passive agents. Its action is intermittent like that of the ligature and the problem of continued traction has not yet been solved. Besides, it has, though in a less degree, all the inconveniences of the simple ligature: inflammation of the gums and alveoli-dental periosteum, suppuration; loosening of the teeth, which become projecting; pains, fetid breath also follows its use, when it is continued a certain time.

"The band is liable to the same objection as all kinds of apparatus composed of several metals, or of gold of low standard, and which must be used to give the band the requisite consistency, acting like a galvanic battery in the mouth, the deplorable effects of which have not been sufficiently attended to by dentists, but are too well known by many persons who have suffered from them.

"The electro-chemical agents in question are not solely confined to the senses, they produce the additional result of decompositions, which extend to the dental tissues themselves. I merely allude to this fact, for the purpose of drawing the attention in a special work.

"The principal piece, is an envelope of Hippopotamus tooth, which is fitted to the jaw, embracing it in the whole extent, adjusted to all the sinuosities; penetrating as far as possible into the interstice so as to embrace a large surface, in order to afford the greatest possible firmness and solidity to the supporting point of the active means for pressing back. The space which this apparatus forms, is considerably open above the misplaced teeth, which it leaves altogether uncovered and which are thus placed between the two blades as plates which serve as a base to the space itself. The blade or plate situated on the side opposite to the irregularity forms a transverse arch, one part advanced, of which the office is to paralyse the antagonistic effect of the lip or tongue by keeping these organs at a distance during the whole time of the operation; the other, is consequently placed in the same direction as the irregularity, that is to say, internally, if retroversion is to be effected; externally, if an eversion, producing a sort of apophysis(?) or artificial process of bone, pierced with holes, and hol-

lowed with a transverse groove on the dental face, which rises parallel with and has the same height and width of each tooth.

"The means of propulsion which I use, is caoutchouc (India rubber) previously subjected to a preparation, which increases its force and elasticity. This substance, cut to a suitable shape, furnishes me with straps which I stretch forcibly between my fingers until they become of a very slight thickness. Then I rub and insinuate them between the teeth or tooth which is to be reduced, and the eminence of the hippopotamus, taking care always to place them at the part corresponding to the summit of the crown of the tooth. The space ought to be so narrow that the caoutchouc can only be introduced with some difficulty, thus producing the desired compression. A thread placed in the opening indicated fills it firmly in this position, from which it would soon escape if left to itself.

"Mode of Action. First.—Reduction should be undertaken as early as possible.

"Second.—In case of anterior irregularity, the first thing to be done is to secure a place in the alveolar circle, for the teeth which we wish to bring back into line.

"Third.—In the making of the apparatus we must keep in mind the ulterior changes which the jaw has to undergo.

"Fourth.—We must be attentively prospectively to the two dental arches, in order that, in the new relation which opposite teeth will afterwards contract, the good effects of the operation may be maintained and confirmed.

"Fifth.—The apparatus should be made of hippopotamus, to guard against galvanic currents and to present a sufficient volume and a form which shall not be cumbersome or impel mastication.

"Sixth.—An essential condition of the successful application of the apparatus is that it shall incase the parts with such exactness as to render impossible the slightest occillation, and that on the other hand, it may be easily taken off so as to permit such frequency of cleaning and other hygienic attentions as are requisite for the health of the teeth and gums.

"Seventh.—The supporting points which the apparatus takes on the dental arch should be as extensive and regularly arranged as possible, in order to avoid unequal pressure, which is dangerous.

"Last.—The force applied to the reduction ought to be slow and continuous in its action."

W. H. Mortimer, in his *"Observations on the Growth and Irregularities of Children's Teeth,"* 1846, speaks on the "Irregularities of the teeth arising 'either from natural, or from accidental causes.' They may be termed natural—first, when they result from the jaw not expanding sufficiently to allow the teeth to form a regular circle; secondly, when they are larger than the ordinary dimensions; and thirdly, when they do not appear in their proper order and place.

"They may be termed accidental when caused by negligence or improper treatment at the time of their growth.

"Accidental irregularities are of four sorts.

"The first arises from neglect, or from ignorance in removing the milk-teeth too soon.

"The second is where the under teeth partially bite inside and partially outside of the upper.

"The third is when all the under teeth close outside instead of inside the upper ones (Fig. 1, No. 1). This is by far the most frightful of all irregularities, and is called 'under hung' (another improper term); for independently of throwing the chin forward, which gives to youth the appearance of old age, it considerably shortens the distance between the nose and chin, and completely spoils the harmony of the face.

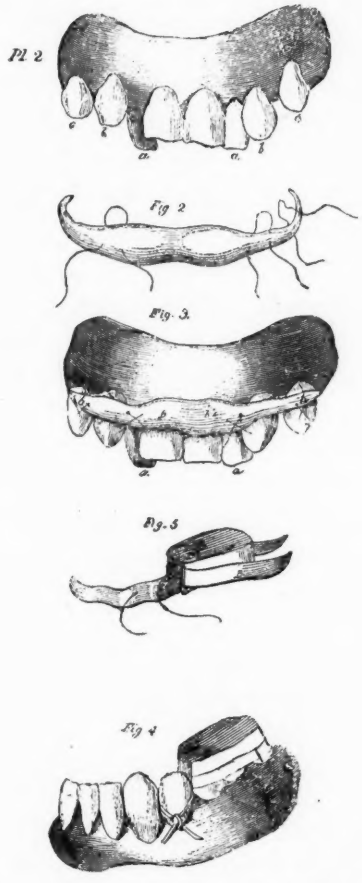

Fig. 1.—Appliance as used by W. H. Mortimer.

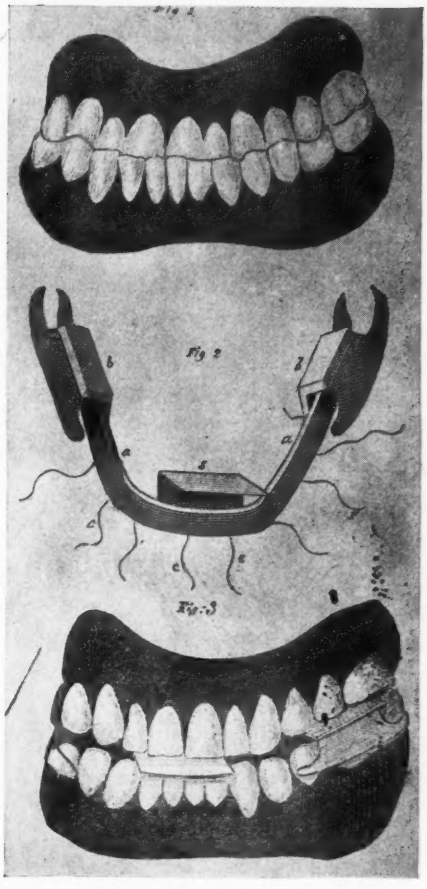

Fig. 2.—Type of incline gold plane as used by W. H. Mortimer.

"The fourth is when one or more of the upper teeth project considerably outwards and are separated.

"A gold plate (Fig. 1, No. 2) must be made, by means of a bronze model of the jaw, to fit close to all the teeth it covers, except those that are to be brought forward; between which and the gold plate there should be a considerable distance as much as if the lateral incisors were in their proper circle. It should extend from one grinder to another (*c, c*) and clasp round them. The plates should be made sufficiently thin to be elastic; but, as it is necessary that it should hold very firm on the teeth, it will be requisite to put a ligature on both sides, to keep it so. By a ligature, I mean that two holes are to be made in the plate (*b, b*) at

the part that covers the tooth to which it is to be fixed. The two ends of the ligature (which must be of strong silk) are then to be passed outwards through them, and a loop is to be left behind (Fig. 2. *b, b*) which is to be passed round the tooth; so that when the ligature is drawn tight and tied, the tooth may hold the plate firm to it. Before, therefore, we attempt to tie the teeth we wish to pull forwards, the plate must be tried and found correct; that is, fixed so firmly to the teeth, that no motion of the lips can move it.

"Holes should now be made, and ligatures put opposite the lateral incisors, and after the plate is fixed at the side, as before described, the ligatures before the lateral incisors (Fig. 1, No. 3 *aa*) are then to be tied as tight as possible, so as to have a constant strain on these teeth, and this will draw them imperceptibly forward to the plate. By the same means we shall accomplish our second intention; for the gold plate, pressing on the sides of the canine teeth, will push them towards the small grinders, and increase the required space for the lateral incisors *a, a.* Fig. 1, No. 3 represents the plate fixed to the teeth.

"We have now to prevent the under teeth from closing outside the upper. For this purpose, a gold plate must be made to cover one or more of the double teeth of the under jaw (Fig. 1, No. 4), and a band of the same metal should be continued on to the two next teeth (Fig. 1, No. 5), and made fast to one of the small grinders by a ligature (*c*). On the gold that covers the top of the double tooth, a piece of hippopotamus or sea-horse tooth should be fixed (*b*), sufficiently high to prevent the upper and lower teeth from touching each other when the jaw closes, and at the same time to serve as an artificial masticating surface for the patient to eat upon.

"In these cases, we must begin by making a gold band, to go inside all the under teeth (Fig. 2) and joined to a plate (*b, b*), that will cover the large grinders on each side. The band should fit close to the teeth at the sides, but not in the middle, so that we may be enabled to draw these in, if necessary. At each side, over the grinders, an artificial mastication surface should be made as directed in case 1. In the center (*s*) an inclined gold plane should come over the under teeth, so that every time the mouth closes, the upper teeth may strike against it, and be pushed outwards. Fig. 2, No. 3 shows the action of the plate upon them.

"If the operation gives no pain to the patient, the inclined plane may be made sufficiently large to cause the whole six front teeth of the upper jaw to strike together.

"The ligatures (*a, a*) are to hold the plate firm in the mouth; (*c, c*) are to draw in the under teeth if requisite."

J. S. Ware "Regulating Children's Teeth," New York Dental Recorder, August and September, 1848.

"Extracting of one or more teeth has been the general plan adopted when the teeth grow in an uneven and crowded position, and in a few cases this is all that may be necessary to secure a perfect dental arch, without narrowing.

"I make a thin gold plate (No. 30) to fit the arch of the superior jaw, and the inside of all the molar and bicuspid teeth, fastening it with clasps passing round the second bicuspid and sometimes round the first molars. It should be made to be worn with ease, and to be easily removed by the patient. The plate

should be stiffened by soldering a narrow piece of gold across the center. To the plate thus fitted to the roof of the mouth and teeth, I fasten pieces of gold of greater thickness than that which the plate is made of (No. 28) to correspond with each tooth which I wish to alter, and of the same width, and if the tooth is to be carried inwards, the plate of gold should be fastened the distance of one line from the tooth, and a ligature is to be attached to it, and to pass round the tooth to be pressed inwards. The ligatures may be made of floss silk, or India rubber; if floss silk is used it must be tightened every day—if India rubber, every third day will be sufficient.

"But when the teeth are to be carried outwards, the plate of gold should be fastened close to the teeth, and made long enough to project below their points, so that when the patient closes the mouth the teeth of the lower jaw will strike the back of the projecting plates of gold, which will force the teeth outwards. These plates of gold which correspond with the teeth to be changed in their position, must be altered from time to time, as the teeth are pressed outwards, so as to keep up a continued pressure upon them, until they are carried to the desired place, after which the plate should be worn at least three months so as to hold the teeth in their position until they become firmly fixed.

"Cases may occur where it will be found difficult to sustain the plate in its proper position. In such cases a piece of gold should be fastened to the plate inside of the first bicuspid, the shape of the capital letter L, projecting downward a little below the tooth or teeth so that the bicuspid of the under jaw will come in contact with the plate of gold before it does with any of the other teeth, this will effectually keep the plate from dropping. In cases where there is space sufficient, between the bicuspids to admit a thin plate of gold, I fasten a thimble to the plate instead of the piece of gold in the shape of the capital L, which completely encircles the teeth, and forms a very firm standard for the under teeth to press against. If the bicuspids are to be pressed inwards, a ligature should be applied in the same manner as described above for the incisor teeth.

"The plate must be removed immediately after every meal, and faithfully cleaned. The teeth of the patient should also be brushed at the same time during the whole time of regulating, and a tonic astringent wash composed of tinctures of cinchona and catechu, equal parts, and tincture of myrrh, half a part, flavored with a few drops of oil of sassafras, will also assist much in hardening and strengthening the gums."

Jos. Engel in 1849, in *"Zeitschr. d. Ges. Aerzte."* endeavored to show that in children at birth, the angle of the lower jaw was between 135 and 140 degrees, that this angle changed as children developed, and in an adult was again similar to a child; that the position of the teeth shifted, were any of them missing, and that generally they moved forward, not backward, due to constant chewing and usage.

James D. White in the *"Dental News Letter"* for October, 1850, described the use of spiral springs in the regulating of teeth, a method both novel and new. This method was later modified by Thomas W. Evans.

"Accompanying this is an arrangement with bands and spiral springs, for enlarging the superior maxillary when it is contracted by premature extraction of the deciduous teeth, or any other cause, which I have used with success, in

many difficult cases for many years, as well for expanding the arch as the regulation of teeth. You will perceive that it is calculated to keep up an equal and perpetual pressure on as many teeth as is desirable. The accompanying model presents an interesting case, and illustrates what are, too often, two inexcusable

Fig. 3.—J. D. White.

errors of the past and present generations, and of daily occurrence. First, that of extracting the deciduous canine teeth, to give the lateral incisors room, as it is termed and which, as their unabsorbed fangs leave a deep wound, in healing draws the lateral incisors and first deciduous molars together, contracts the alve-

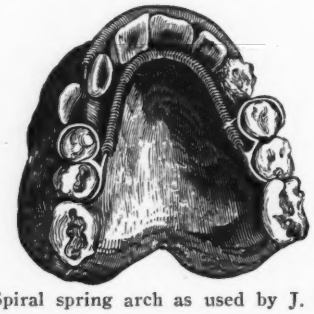

Fig. 4.—Spiral spring arch as used by J. D. White.

olar arch, and allows the laterals to fall backwards and inwards, dragging the lateral edges of the front incisors along with them and sometimes before they are long enough to grasp the inferior teeth, in advance, they are much behind them; and second, to mend the matter when the permanent canine teeth make their

appearance apparently too far outside of the arch, (it is true but a deformed arch) and only room for half a tooth between the laterals and bicuspids and in some instances none at all, either they, or the first molars, the most valuable teeth in the head, or the bicuspids, are doomed for extraction to make still more room instead of endeavoring to remedy by art that which ignorance has done, enlarge the arch and bring out the six or eight stray teeth to the canines which are in most cases in their proper places. The manner of making it is exceedingly simple; make a plaster model of the mouth in the usual way, then fit a light band around each tooth, joining each other at feather edges between the teeth, instead of filing between those that require to be thrown outwards. Say, for instance, it is the superior bicuspids on either side; solder those bands together on the palatine sides of the teeth, then solder a short piece of wire on the same sides of the bands near their middle, and thick enough to allow of slipping on a spiral spring long enough to extend from one side of the arch to the other, and to lie close along the posterior parts of the front teeth; now if those bands are nicely fitted around the teeth, the apparatus can be worn with comparative comfort; the patient can go to school, as it is generally in school days that the operation is required; or even into society without exposing so much gold as those horrible bars that go all around the front part of the teeth and gums. Another method for applying the spiral spring and which is original with myself, though I do not name it to claim any credit, is as follows:

"It often happens that the two lateral incisors are grasped posterior to the inferior teeth, and the front incisors are in their proper positions. By lashing down the extremities of a piece of spiral spring to the necks of the lateral incisors, and the spring extending across the two front incisors, you will perceive that they become a fulcrum for the spring to throw the laterals over the lower teeth. As the spring straightens, the laterals will be brought on a line with the central incisors. It is generally true, that, as the front teeth are harder to force backwards, on account of the alveolar process being thicker on that part than the external alveolar plate, and the teeth being large too that they afford sufficient fulcrumage. But if they be not, place a plate in the roof of the mouth, and fasten it to the back teeth, as if it were to set teeth, letting small pieces of plate project forward and downward against the posterior parts of the front teeth, which will prevent the possibility of their being pressed backwards.

"But if it be like several cases that I am now treating where the front teeth are too for out, by the time the laterals are well forward, the front will be depressed sufficiently. Or when the median edges of the front teeth present the appearance of bulging out, the spring pressing upon them will level them down properly. If the laterals be too long to sweep over the lower teeth solder to the plate, if there be one in the mouth, an inclined plane to keep the jaws apart far enough for that purpose. When the plate is not in, lash the incline plane to one or more of the teeth. Never put a cap on over a tooth to receive the direct or full stroke of the jaws in masticating. I have seen cases where the enamel has been literally smashed by that means. As many injuries have been sustained in various ways, in the treatment of irregularity of the teeth, many persons needing attention will not venture to submit to the operation. All cases require close watching that too much pressure is not produced so as not to

establish periosteal inflammation in teeth that are not fully developed. I use also the spiral spring for turning the teeth that stand across the alveolar ridge. There are a great variety of ways of applying those springs so as to make a very neat and comfortable apparatus for enlarging or contracting either of the maxillaries or for operating on a single tooth."

Fourth Period—Time of Harris to Farrar and Kingsley

Chapin Aaron Harris (1806-1860) was one of the most versatile and talented men in the dental profession; educator, journalist, author and organizer. He, with the able assistance of Horace H. Hayden, succeeded in elevating what was then dentistry, to a science. Their efforts resulted in the establishment of the Baltimore College of Dental Surgery, 1840, the first school for the education

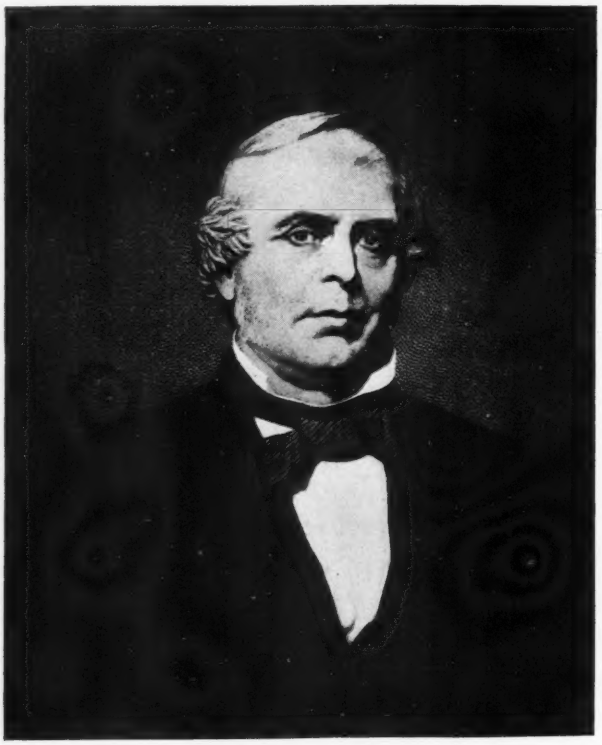

Fig. 5.—Chapin Aaron Harris. (1806-60.)

of dentists; the organization of the American Society of Dental Surgeons, now the National Dental Association, in 1840, thus bringing together the few widely scattered dentists of his day so as to enable them to work more effectively in building up what was then a new profession. In order that the men who were devoting themselves to the care of teeth, might disseminate knowledge and professional news, he successfully brought out the first number of *"The American Journal of Dental Science"* in June, 1839, the first periodical journal devoted to dentistry.

Harris in his *"Principles and Practice of Dental Surgery"* says:

"In describing the treatment of irregularity, we shall notice the means by

which some of its principal varieties may be remedied; otherwise, the application of the principles of treatment would not be well understood, since it must be varied to suit each individual case.

"As a general rule, the sooner irregularity in the arrangement of the teeth is remedied the better, for the longer a tooth is allowed to occupy a wrong position, the more difficult will be its adjustment.

"The age of the subject, therefore, should always govern the practitioner in forming an opinion as to the practicability of removing irregularity.

"The first thing claiming attention in the treatment is the removal of its causes.

"When it is the result of narrowness of the jaw, either natural or acquired, a permanent tooth on either side should be removed to make room for such as are improperly situated.

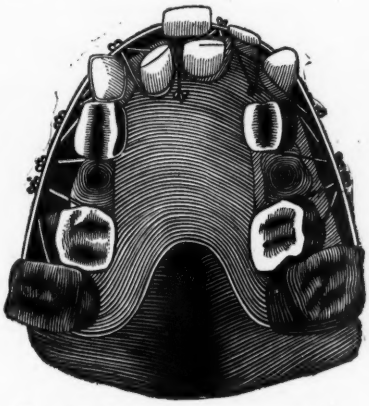

Fig. 6.—Type of arch as used by Chapin A. Harris.

Fig. 7.—Gold caps and ligatures as used by Harris.

"Without going into a minute detail of the method adopted for procuring the appliance employed, it will be sufficient to refer the reader to Fig. 6. This represents a plaster model of the teeth, alveolar border, palatine arch, and the apparatus employed for remedying the deformity. The second bicuspids were first extracted, then, by means of ligatures applied to the second molars and first bicuspids, and made fast to a band of gold passing on the outside of the arch, which were renewed every day, these teeth were brought out to their proper position in eleven weeks; this done, there was a space of nearly an eighth of an inch between the cuspids and first bicuspids; this was filled up, by bringing back with ligatures, the former to the latter. A ligature was next applied to the right lateral, passed through a hole in the gold band in front, and made fast. In ten days this tooth was brought to its proper place. A ligature was now attached to a knob soldered on the gold plate behind the teeth on the inner side of the alveolar border for the purpose, and tied tightly in front of the projecting right central incisor. In about three weeks this was brought to a position along side the lateral incisor of the same side. The left central was then, in like manner, brought forward, and the left lateral carried backward to its proper place.

"A gold plate of the ordinary thickness should be swaged to fit the first and second molars, if the second has made its appearance, and if not, the second bicuspid and first molar on each side of the jaw, so as completely to incase these

teeth. If these caps are not thick enough to prevent the front teeth from coming together, a piece of gold plate may be soldered on that part of each which covers the grinding surfaces of the teeth, and having proceeded thus far, a small gold knob is soldered on each side of each cap, and to each of which a ligature of silk or gum elastic is attached. These ligatures are now brought forward and tied tightly around the cuspids. When thus adjusted, the lower arch will present the appearance exhibited in Fig. 7. By this means the cuspids may, in fifteen or twenty days, be taken back to the bicuspids; but, if in their progress they are not carried towards the inner part of the alveolar ridge, the outer ligatures may be left off after a few days, and the inner ones only employed, to complete the remainder of the operation.

"After the positions of the cuspids have been thus changed, the gold caps should be removed and a circular bar of gold, extending from one to the other, so constructed as to pass about a quarter of an inch behind the incisors, should now be soldered at each end of the inner side of each cap, and a hole made through it behind each of the incisors, through which a ligature of silk may be passed, and after it is placed in the mouth, it is brought forward and tied tightly in front of each tooth. These ligatures should be renewed every day until the teeth are carried far enough back to strike on the inside of the corresponding teeth in the upper jaw."

W. H. Allen in the *New York Dental Recorder,* March, 1850, in describing a number of *"Cases of Irregular Teeth,"* says:

"Having had several complicated and difficult cases of irregular teeth to treat in my practice, and having been solicited by professional friends to publish them in the *Recorder,* I have finally determined to give you, as near as I can, a description of a few of the most interesting, with my mode of treatment, and the success attending it, premising that I claim nothing particular new or meritorious in the methods pursued for reducing them to regularity.

"The second bicuspid was extracted from each side of the lower jaw and the teeth, one at a time drawn back into their natural position. This was effected by first fitting a gold band, with clasps attached to the anterior molars, passing round a little back of the teeth to be moved, and having a small ivory block attached on each side, for the antagonistic teeth to bite on, so as to permit the lower incisors to pass back under those of the upper jaw. From this band, ligatures of India rubber extended around each tooth requiring to be moved and soon brought them back to the gold band. It was necessary then to keep the apparatus on until the teeth became firmly set in their new position."

In another case we find the screw being again made use of, the irregularity was remedied in the following manner: "two caps with strong clasps attached were fitted to each anterior molar, and to these clasps a thick stiff piece of plate was attached, passing round in front of all the teeth. A nut attached to this screw, outside the plate tightened a little every day, soon brought the tooth forward into its proper position.

"The lateral incisor was brought into place by means of ligatures of India rubber attached to it, and tied in front of the plate. The plate was worn about three months, since which they have remained in a natural position, except that

the teeth are a little crowded, which might have been prevented if he had consented to the removal of the bicuspids as I advised."

Another method used by Allen was that, "A plate (*a*) was made to fit the roof of the mouth fastened by clasps (*b*) to the first molars; ligatures were attached to this plate, and tied round the laterals, by means of which they were soon reduced to their proper position. I then soldered the two ends of a gold plate—extending outside the teeth—to the clasps on either side. Bands of gold were fitted round each of the front incisors with a wire two lines long (*c*) projecting from the front side and passing through a slot in the outside plate; I then tied ligatures of India rubber from the ends of these wires to pins fastened in the outside plate, far back, near the clasps; these produced a rotary motion in the teeth which soon affected their regularity. (Fig. 8.)

"A plate of gold (see Fig. 9) following the palatine arch, which was very deep, from one side to the other, was affixed to the bicuspids of each side by clasps. This plate is so made, that when attached to the teeth, it should constantly press them and the alveolar process outward, towards the cheeks. To

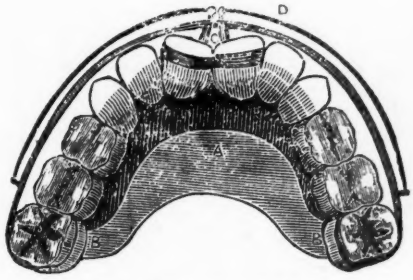

Fig. 8.—Appliance of W. H. Allen.

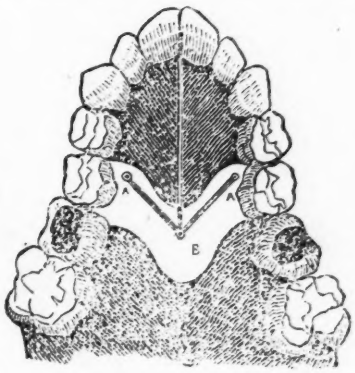

Fig. 9.—Another appliance of W. H. Allen.

keep up a constant outward pressure, two gold wires were attached to the plate with hinges at *A.A.* meeting and forming nearly a right angle at *B.* where was fastened a strip of caoutchouc, which, being passed between the median incisors, drawn tight, and fastened, produced the double effect of widening the palatine arch, and of pulling back the incisors, which projected too far by three or four lines. This apparatus was kept on and occasionally tightened, for several weeks, when in addition, I soldered each end of a thick gold plate, about three lines in width, and long enough to extend outside the teeth, from the bicuspids of one side to those of the other, to the clasps of the former plate. This passed outside of the teeth in a true and regular arch, and being pierced with holes opposite each tooth they were easily reduced to their proper position by means of ligatures of caoutchouc, carried round the teeth, and fastened outside the plate. This being done nothing remained, but to keep the teeth in their new positions, until they became firm, which necessarily occupied several weeks, on account of the complication of the irregularity.

"The inferior jaw was necessarily treated in a somewhat different manner, in consequence of the interposition of the tongue; the process was quite simple, however, and very effectual. Finding the first molar (*A*) of the left side too far

decayed to admit of being filled, I extracted it; the lateral incisor (*B*) of the right side was almost removed, on account of the crowded state of the teeth. A plate of gold (see Fig. 10) was then fastened by means of clasps, to the large molar of the right side; and to the second bicuspid of the left, which by its own elasticity, spread the teeth of each side sufficiently, in a few weeks. Holes being punched through this plate opposite each tooth, ligatures of caoutchouc were applied as upon the upper jaw, and kept on until the teeth assumed a position to antagonize properly with those in the upper jaw, and had become firm; the plates were then removed."

Wm. Lintott "Structure, Economy, and Pathology of the Human Teeth," in the *Dental News Letter*, 1852, p. 19, on *"Irregularity of the Teeth,"* says:

"The contour of the features depends essentially on the form of the jaws. A lofty forehead, expressive eyes, a well shaped nose, are most effective adjuncts; yet the character of the countenance, as a whole, will be especially influenced by the position of the lower, and the due expansion of the upper jaw. When it is understood how far this desirable conformation depends on the ar-

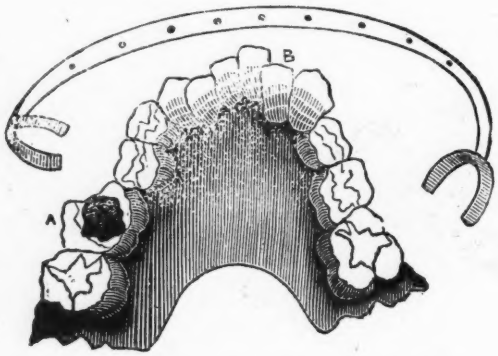

Fig. 10.—A type of arch used by W. H. Allen.

rangement of the teeth, a due importance will be at once attached to their progress, and the proper degree of watchfulness extended to them particularly as regards the fairer portion of creation.

"Deformity of the jaws may in almost every case be traced to an improper interruption of nature, in prematurely extracting the shedding-teeth. So long as man is content to follow nature, all will go well; but no sooner does he attempt to take the rein, than the mischievous effects of his interference become apparent.

"The process by which nature frees the jaws of the temporary teeth, when their presence is no longer required, is by the absorption of the fangs. By this action the crowns are deprived of all other support than that which the attachment of the gums affords, and consequently they will either come away themselves when pressed on by food, or will be detached easily by the fingers. Sometimes, however, the progress of absorption of the fangs of the shedding teeth is not commensurate with the growth of the permanent teeth, and the latter will thus be more or less diverted from their proper positions. For this reason it is requisite that the mouth should be frequently examined during the period of changing the teeth; and as soon as the point of the permanent tooth

pierces the gum or presses so hard against it as to be easily discoverable, then and not till then, should the temporary tooth, which is in the way be extracted. If parents would content themselves with ascertaining that no obstacles of this description exist, that the six upper front teeth shut just clear over and beyond the six lower, and would leave the rest of the operations of nature at least until the age of fourteen or fifteen, the frequency of irregular conformations of the mouth, and consequent deformity of the features, would be greatly diminished.

"There are, of course, some exceptions to this rule. Original malformation and contraction of the jaw bones may exist, and the size of the permanent teeth may be utterly disporportionate to the expansion of the maxillary arch. Supernumerary teeth may be formed, and pressing upon the others, may force them out of their true position, and produce a considerable degree of irregularity; and whenever it so happens that a front tooth of one jaw is, in closing the mouth, brought into irregular contact with another of the opposite jaw, one or both will be driven out of their proper position.

"An accurate model of both upper and lower jaw must be obtained, from which a casing or capping for the teeth of the lower jaw is to be stamped out of a thin plate of either gold or silver. The capping is to be continued from the first or second molar of one side round to the corresponding tooth of the other; it must fit closely over the grinding surface of the molars, where it must be rendered thick enough to prevent, by its interposition, the contact of the front teeth. The plate must overlap and fit closely also to the outer side of the molars, and be carried entirely down the inner side, and partly on the gum; over the canines and incisors, it must extend rather more than two-thirds down, inside and out—opposite the space between the necks of the molars, the plate is to be perforated, so as to permit the passage of one or more ligatures, which, tied around the necks of the teeth, secure the capping firmly in its place—on the ridge of the capping is soldered a thin plate of the metal, edge-wise, which must be smoothed gradually off. The whole apparatus being thus prepared, it only remains so to adjust the opposing edges of the capping and upper teeth, that when properly fixed, the edge of the capping shall, on closing the teeth, just slide inside that of each of the six upper front teeth.

"Another means is the employment of a light bar of gold or silver, passing round their front surface, by means of which they may be either drawn outwards or driven inwards as the nature of the irregularity may demand. The mode of preparing the bar, adjusting and securing it with sufficient firmness, is the same as for the capping already described, excepting that it requires to be fitted to the upper teeth only. The capping over the bicuspids, by which the closing of the teeth is to be prevented and the apparatus fastened, is to be carried well down their external surface, and to this part of the capping, a bar is to be soldered extending from the first bicuspid on one side round to the same tooth on the other. The inner face of the bar is to be modeled so as to fit closely and evenly to as many of the six front teeth as already stand so far forward as to come up to or beyond the desired position. If none of the teeth are thus far advanced, the bar must be made to describe exactly the line of the arch in which they ought to stand. Precisely opposite the center of each tooth which is to be brought out, a strong piece of similar metal must be soldered into the upper edge

of the bar; from these points ligatures of a material known as "Indian Twist" are to be passed round the necks of the irregular teeth, and drawn daily closer and closer, until the teeth, yielding to the constant pressure thus brought to bear on them, approach the bar and assume their proper position. When any one or more teeth project beyond the right line, and it is desired to move them inwards, a small hole must be drilled through the bar, over against the most prominent point of each; a screw-thread is then to be cut, and a short screw introduced, which, working through the bar, will by a turn or two each day, keep up such a continued pressure against each tooth as will quickly force it back as desired. The projection of the screw-heads must not be so great as to cause annoyance to the lip; and longer screws must be kept ready for use, in order to reach the teeth as they recede from the bar."

It will hardly be amiss to include in this historical review of Orthodontic literature the report of the annual meeting of the *American Society of Dental Surgeons,* as found in the September number of the *Dental News Letter* of 1852. The action taken by the society and the remarks included in the paper by *Dr. Tucker,* fully illustrates the spirit of those early pioneers in orthodontia, the willingness to impart to the profession those facts that might tend to elevate the standard of the dental science, irrespective of remuneration and for the benefit of "a chosen few." How much further, and better off would orthodontia be, if this same feeling prevailed today.

"Dr. E. J. Tucker read a paper on the subject of *"Dental Irregularities,"* which was fruitful of instruction upon the subject treated, containing many hints of importance to the profession.

"On motion of Dr. Hullihen, of Wheeling, Va., voted a gold medal, of the value of $25.00 be awarded by this society for the best paper upon the cause and treatment of the irregularities of the teeth, to be read at the next annual meeting of this society."

E. Tucker, "On Irregularity of the Teeth," Dental News Letter, 1852, page 95:

"I did not consent with any conviction that I should render a service that might not be better given by others, but rather from a sense of duty that the humblest member of society owes to himself and to those with whom he may be associated, always to use at all times his best endeavors to do what he can to promote a common object.

"The American Dental Society was not, I presume to say, formed for the display of mere theoretical knowledge, but rather with a more utilitarian purpose, that of interchanging the practical results of a common experience and of communicating opinions without ceremony and without a spirit of rivalry, in regard to the vital interests of our profession. I speak only for myself—as you are all better acquainted with the opinions of others than I am. It will not be expected that I should tax you with any fragments of learning, knowing full well that where the whole is possessed the parts are not wanting.

"In speaking of the irregularity of the teeth, I claim your attention upon a subject which has an importance in itself, and which required rather the application of an ordinary knowledge, than any great exertion of genius. In the spirit of a praiseworthy ambition to discover new things, we are apt, very apt, to hold

old ones in contempt. In attempting to accomplish some end for notoriety, we are too much given to the habit of neglecting what many might denominate trifles.

"It is a recent thing to attempt to regulate the natural growth of the teeth, as if they were to be made an exception to every thing else. To remove a tooth has been considered as equivalent to the loss of a tooth, as if numbers were regarded in the light of compensation for irregularity.

"If the pulling rings which I have commended to the profession, do not invariably result in improvement, we have no right to infer that their use is to be condemned. Such a principle would lead us to discard all but literally sovereign remedies, known only to the credulous and the quack.

"Having two difficult cases some six years since, I was led particularly to study the best means to be employed in managing them. The spiral springs were too stiff, or too yielding and the gold bands were difficult to adjust. I looked for a substance that would accommodate itself, if I may so express myself, to the circumstances of the case, a substance that would exert a steady power, and adapt itself to the variations of a changing growth in the teeth, which were the subjects of treatment. I could think of nothing more proper than India rubber, and with a view to obtain rings of various extent, I ordered tubes to be made of the different sizes which, by cutting transversely, I had at once a class of instruments the simplest of the simple, and the cheapest of the cheap. They were easy of application and with improvements such as I have been able to make, they proved to be efficient for all ordinary cases of irregularity.

"In favoring the use of India rubber tubes, or rings, I would not be understood as underrating all other contrivances, or any of them. I speak an honest opinion, founded on my own experience. Let it be received for what it is worth. I ask no commendation that contributes to personal consideration, or to motives which are not common to the profession. Though simple, these rings cannot be used with advantage, unless applied with the utmost care, indeed, a careless application of them may create new difficulties, or aggravate old ones.

"The exact position of the teeth, the line of force to be observed, and the tensity of the power to be exerted, are all considerations requiring study, and a careful judgment. I submit the means for your consideration and trial, well knowing that you are too practical in your views to decide upon their usefulness without a knowledge which alone can come from experience and observation, and that you will not be inclined hastily to condemn any method of practice which promises a common good, without a patient and unprejudiced examination. It might seem to a superficial person as favoring too much the profession, if we were to recommend to the parent and physician, an early resort to the dentist for advice and service, in reference to the teeth of children; and yet, such a course would result in economy and comfort.

"I would advise a wide survey for discovery, that no one may be neglected who has genius and skill, and a disposition of inquiry. Such a line of conduct, may lead not only to the improvement of others, but result in profit to ourselves. I am no friend to professional jealousy, to that stinted view of things which commences with suspicion, and ends with contempt. It is unworthy of a man, when considered in his moral relations, as being responsible of his motives and

his acts. We sometimes avoid men, because of preconceived opinions which are unfavorable to their standing, or capacity, when perhaps a more disinterested mood of intercourse might often times bring within our sphere persons eminently fitted for professional distinction, and who require no aid but the right hand of fellowship to ensure a confidence and to command a skill. Genius is limited to no class—success is confined to no family. The brightest gem is sometimes thrown up by the humblest miner, and it is not for us to say who is to be or who is not to be, the leader in discovery, the greatest in our art, or the profoundest in his inquiries in advancing science and elevating the profession with which we are proud to be identified."

Fig. 11.—Thomas W. Evans. (1823-97.)

J. L. Levison, in *"Jaws and Teeth of Semi-barbarous Men,"* (1852) says:

"The jaws of civilized men are more contracted than those of semi-barbarous race and this is the result of the direct violation of the Creator's laws, who wills that the brain and nervous system of the growing child should not be overtaxed and that the dental process of attempting to build up the organic instrument and cultivate the mental faculties at the same time is a matter almost impossible to accomplish."

Thomas W. Evans (1823-1897) on his return to his native country from Paris read a paper *"On the Regulation of Teeth,"* in which he showed a number of new methods in Orthodontic treatment. One method in particular, although brought out by many in later years, as new, we employ in our present day procedure. He described a means of anchorage made by soldering a metal tube to the side of a band. Through the tube, he passed a hard drawn flat wire that was to be "lengthened or shortened with screw-nuts." Since that time tubes

soldered to the band with an adjustable arch have been in use. During the early numbers of the American dental periodicals, illustrations were rare, therefore many well known devices were merely described and not illustrated, and for that reason we presume "what is new is really old."

T. W. Evans of Paris, "On the Regulation of Teeth," pages 65-75, *"Dental News Letter"* (1854):

"I need not impress upon any person in this audience, gentlemen, that irregularity of the teeth is one of the most fruitful causes of their decay. To prevent this irregularity or where such precaution has been neglected to remedy it, is one of the most important branches of dental science. I have therefore made it a particular study. Circumstances have favored this course.

"I do not hesitate to say that nine-tenths of those who are in constant consultation with a dentist, would rarely, if ever, have had personal occasion for his services, if their teeth had been properly regulated in childhood. Irregular and defective teeth, now the almost universal rule would, if the proper precautions were taken, be the rare exception. Hence the pre-eminent importance of our profession; hence the family dentist is as necessary in every community as the family physician.

"But for a long time I was seriously inconvenienced in my operations for want of sufficiently complete apparatus. Much of that in general use, I found to be often inefficient, and generally very annoying, if not injurious to the patient. I have accordingly spent much time in constructing apparatus suited to my own practice; apparatus uniting all the conditions of promtness and efficiency, and giving the least possible inconvenience to the patient. Ligatures as generally employed, I found peculiarly open to objection; for besides their rarely operating with sufficient certainty or steadiness, they often loosened the teeth to which they were attached for support, and almost invariably tended to lay bare the gums.

"As for the other apparatus of bars, springs, caps, plates, inclined planes, etc., while there were portions of it not without merit, and some of it showing great ingenuity, it was, for the most part, so complicated or so cumbrous, that in the few cases where it accomplished the desired end, it did so only with an amount of fatigue and pain to the patient that he often found the remedy worse than the disease. These difficulties I have sought to avoid, and the success I have met with in most of my operations, some of them extremely difficult, has compensated me a thousand fold for my pains. The chief duty which remains to me is to communicate the result of my labors to you, my much esteemed colleagues, and through you to the profession at large.

"The principal desiderata in apparatus for the regulation of teeth are:

"1st. A firm support which shall not loosen or in any way injure the teeth, to which it is attached. 2nd. A steady and sufficient pressure, which can be graduated to suit particular cases, and particular stages of an operation. 3rd. Great delicacy of construction that the apparatus may be as light as possible, so as neither to injure nor annoy the patient. 4th. Finally, a mechanism as simple as the case will admit of in order to economize both labor and time.

"The first case which I would call to your attention, as illustrating the advantage of the apparatus, is that of,—

"Restoring an oblique upper incisor to its place.—The first thing, of course, is to make room for the operation, if as is generally the case, room is required. This is accomplished by bits of India rubber one-sixteenth of an inch in thickness, which are inserted between the irregular tooth and its neighbor on each side, and is prevented from sliding up to the gum by means of waxed floss silk wound tightly round the middle of the tooth. The necessary space obtained, I take a piece of fine hard wire, about the size of a common pin, and winding one end of it twice round the middle of the oblique tooth, very closely, I pass the other end along to the bicuspids or molars, to which I attach it by means of a joint—mechanism of two nicely adjusted bands or rings—forming a kind of yoke which

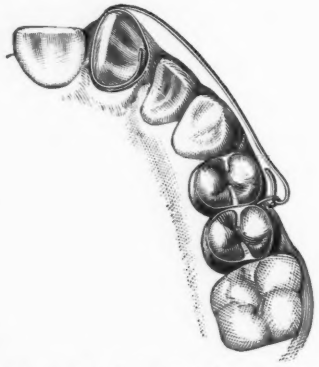

Fig. 12.—Method of rotating incisors.

Fig. 13.—Clamps or bands as used by Thomas W. Evans.

Fig. 14.—Band with gold tube soldered to same.

Fig. 15.—Retainer.

is slipped over two of the bicuspids or molars, and is prevented from slipping up to the gums, by means of wire clamps which hook on to their grinding surfaces. (Fig. 12.) These clamps may be so constructed, when an operation requires it, as to prevent the teeth of the upper and lower jaw from coming in contact with, or overlapping each other. (Fig. 13.)

"It will be seen at once, that if this apparatus is rightly applied, the hard-drawn wire being elastic, and serving at once as lever and spring, will bring the oblique tooth round to its place in a short time. But in all cases where, from the age of the patient, or for any other cause, the tooth is too refractory to submit to so gentle a lever, I modify the apparatus as follows:

"First.—Carefully adjusting a gold band (made of 22 carat gold, so as to

be sufficiently malleable) round the center of the tooth to be operated upon. On the front of this band, and directly across it, I solder a small gold tube, the bore of which is about the size of a common pin, through this tube, I pass a hard-drawn wire fitting very closely and then attach the outer end of it (which has a loop or eye for the purpose) to the yoke or skeleton cap above described, which is previously fitted to two of the molar or bicuspid teeth. (Fig. 14.) In this way it will be seen we have a more powerful lever than before, and one which is equal to any emergency. This operation being completed the tooth is kept in its place, by means of a small flattened wire, (somewhat smaller than a knitting needle,) which I pass in front of the incisors as far as the eye teeth on each side, to which it is attached by means of a small frame work with two hooks, which I solder to it, and which taking hold of the cutting edge of the central incisors afford a firm and steady support. (Fig. 15.) It is obvious that the wire band thus arranged and sustained will easily keep the restored tooth in its place. The length of time it must be worn depends upon circumstances. It should be removed as often as possible, for the purpose of cleansing.

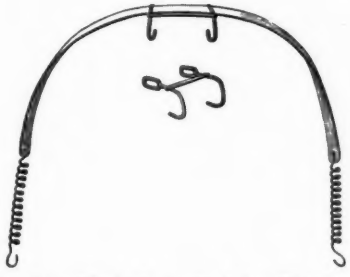

Fig. 16.—Method devised by Thomas W. Evans to correct protrusion of the anterior teeth.

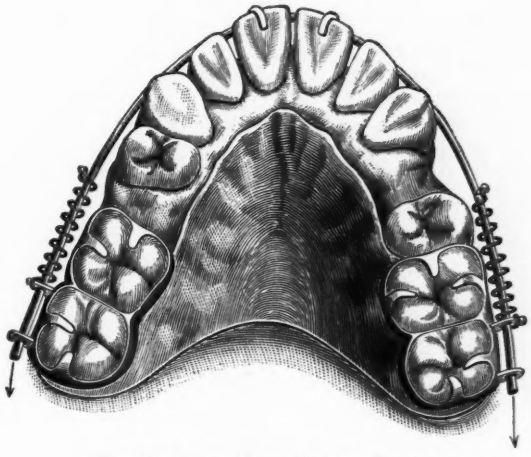

Fig. 17.—Fig. 16 applied to the teeth.

"Protrusion of the front teeth.—I remedy this irregularity by means of a narrow elastic bar of gold, which is attached to the front of the teeth to be operated upon, by means of a kind of wire grating, constructed with hooks which take hold of the cutting edge of the central incisors, and keeps it, the bar in its place. (Fig. 16.) Having slipped this bar into the grating firmly, I pass the ends along to the strongest molars on each side, to which it is attached, by means of short spiral springs, the molars used for support having previously fitted to them the yoke or skeleton cap already described. Now to give this elastic bar with its spiral springs an absolutely firm and steady support, which should have its pressure equally distributed over the mouth instead of being confined to one or two teeth, I prepare a thin gold plate of the most delicate workmanship, which is moulded carefully to the roof of the mouth, and kept in its place by attaching to the molar teeth by the apparatus which already secures the gold bar. This plate, if nicely moulded to the irregularities of the mouth, has its pressure, as I have said, equally disturbed, and renders it impossible that the teeth used for support should be loosened, since they are sustained by the

whole palatin arch against which the plate presses. The elastic bar with its spiral springs, has thus the firmest and steadiest hold possible and can only move the teeth which it is intended to move, and these it brings easily and quickly to their place. (Fig. 17.) The patient easily gets accustomed to the apparatus because of its great delicacy of construction and finish. I should add that, as the teeth come gradually back to their place, they will naturally force the gum inward. The plate must therefore be moved several times during the operation and be modified, both in size and form; care being taken always to have it nicely adjusted and to keep it at least one-third of an inch from the backs of the teeth to be operated upon.

"The advantages of this apparatus over the use of ligatures as commonly applied have already been hinted at in the course of the description. They may be summed up as follows:—(1) By avoiding the risk to which ligatures are usually liable of injuring the teeth by slipping down to the gums. (2) By having an absolutely firm and steady support, equally distributed over the mouth, I avoid loosening the teeth used for support, and then give the patient the least possible annoyance. (3) By means of the gold plate fitted to the roof of the mouth, I accomplish the important desideratum of acquiring a sufficiently strong support for any power I may wish to exert upon the teeth to be operated upon, without (as I have said) running the risk of displacing any others. (4) In fact, the power obtained by means of my elastic lever and spiral spring with their firm steady support, is much greater than the traction of any apparatus of ligatures or any apparatus whatever not thus supported, and is, therefore, easier, more prompt, and surer in its operation. To keep the front teeth in their place after they have been restored, I first remove the plate which has been modeled to the roof of the mouth, and then re-adjust it upon a new cast, attaching it by the same means as before to the molar teeth; then take a piece of hard elastic gold wire, flattened to about one-sixteenth of an inch in width, and pass it along in front of the teeth which have been operated upon, attaching the ends of the rings which have been previously re-adjusted to the molar teeth on each side. This elastic band, pressing gently against the teeth, easily accomplishes the purpose.

"The next step is to adjust the yoke or skeleton cap already described, to the strongest molars on each side of the mouth. Next, molding the gold plate to the roof of the mouth, in the manner mentioned in the last case, commencing pretty well back, and coming forward to within about one-fourth of an inch of the deviating teeth; this plate is attached to the molar teeth by mechanism just alluded to—the whole forming in fact, but one apparatus each part of which is necessary to the other, and to the whole. Having thus secured the strongest and steadiest support, I solder one end of a gold wire (about the size of a knitting needle) to the face of the innermost ring attached to the molar teeth, and as near as possible to the back edge. The other end of this wire (the whole being hardened and flattened from the soldering point), I pass along on the outside and parallel to the margin of the gum, at about one-sixteenth of an inch distance from the teeth, and slide it into a small tube, which I had previously soldered for the purpose, to the back edge of the skeleton cap, adjusted to the molars on the opposite side of the mouth. This bar is kept from slipping too far through

the tube by being tapered at the end, which causes it to enter like a wedge; on the other hand, it is kept from receding from the tube by means of a small nut, or being flattened at the end. (Fig. 18.) The average width of the bar is about one-sixteenth of an inch. I curve this bar along the margin of the gum, as already described, and then attach each of the deviating teeth to it, by means of circular India rubber bands cut from a pipe or tube; these bands are first slipped over the tooth, then stretched under the bar, to be brought up on the other hand side and re-attached to the tooth, by which means they have a firm, double hold and traction. Nothing need be added to show that these strong, elastic bands thus supported, accomplish the work of bringing forward the teeth in a manner at once simple and easy. In this case as in the last, I retain the restored teeth in their place, by re-adjusting the gold plate, having first however, added to it a kind of supplement extending to the inner face, and carefully adapted to their posterior and irregular surface. This plate secured as before, and with the supplemental plate resting against the restored teeth, checks their tendency to grow inwards and thus maintains them in their proper position.

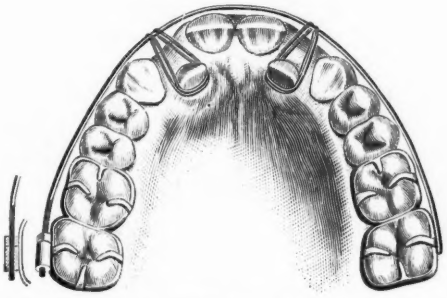

Fig. 18.—The beginning of the modern orthodontic arch, threaded with nut attached. Used in conjunction with a tube soldered to a band.

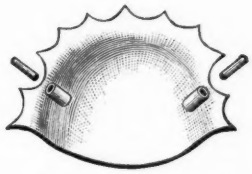

Fig. 19.—Gold plate.

"The next case is where the same front teeth, instead of all being within the dental ridge, have grown irregularly—some within and others without, or what is called zig-zag. In this case I naturally use about the same apparatus as before, with this difference; that the flattened wire or bar, is made smaller and more elastic, and can be lengthened or shortened by means of screw-nuts. The teeth which grow inwards are brought outwards by means of India rubber ligatures attached to the band. I preserve these teeth in their places by striking up a fine, thin gold plate over the backs of the six front teeth, extending down from one-fourth to three-eighths of an inch, and running over the cutting edges about one-sixteenth of an inch. This plate, made of soft ductile gold, should be carefully adapted into the inequality of the teeth and maybe generally kept in its place by the mere effect of suction, or on the principle of atmospheric pressure but where atmospheric pressure is not sufficient, with the ordinary shape of the plate I modify it (the plate) by making a small air chamber in it, which I have generally found to answer the purpose. Another way of keeping the plate in its place is, to let it extend back as far as the first bicuspid, and solder a tube to it on each side, with the mouth opening against these teeth; into these tubes is inserted a piece of hickory wood which swells enough to afford a sufficient support. (Fig. 19.)

"The skeleton cap or yoke is fitted to the two strongest molars; one end of a gold wire, about the size of a knitting needle, is then soldered to the back part of the yoke, and carried to the other end, forward to the deviating tooth, to which I attach it by means of a silk or India rubber ligature. The elasticity of the wire, which, of course, is hammered hard from the soldering point, is sufficient to bring the tooth back to its place in a short time. The apparatus for keeping this tooth in its place, is also applicable to several cases, as the intelligent hearer will perceive. It consists simply of a thin gold plate, curved over so as to take hold of the front teeth by their cutting edge, and keep them in their place by this hold, and by suction.

"I have thus far spoken chiefly of the irregularity of the upper incisors, but one of the commonest cases I have to treat is that of,—

Protrusion of the eye-teeth.—My mode of treatment, is, substantially as follows:—if the teeth are so crowded that there is hardly sufficient room for the canine to come down to its place, I bring the incisors forward in the manner already described, and in this way easily obtain the necessary space by the expansion of the dental arch. But if the space wanting is too great to be obtained in this way—in other words, if the bicuspids and incisors touch, or nearly touch —I extract one of the former and then, if the tooth is so high up that in waiting

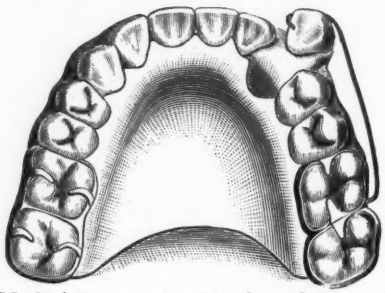

Fig. 20.—Method to correct protrusion of the canine teeth.

for it to come down we are likely to lose the space thus obtained, I construct an apparatus for hastening the descent of the tooth and guiding it to its place. This is applied as follows:

"I adjust the yoke or skeleton cap, already described, to the molar teeth, which I prevent from being loosened or displaced by means of the gold plate moulded to the roof of the mouth. I then solder one end of a gold wire to the back of the skeleton cap, and having hammered the rest from the soldering point, so as to make it elastic, I curve it inwards towards the eye tooth, against which the other end of the wire presses gently, operating as a spring, and aiding and directing the tooth to its place. (Fig. 20.) If the protrusion be such as to require it, the wire may be crooked where it touches the eye-tooth, so as to bring it both inward and downward.

"I have thus, gentlemen, given you, as clearly as it is possible for me to do in a public lecture, some of the results of my labors in the way of regulating teeth. If I have failed to make myself perfectly clear, I shall be happy to make any explanation which may be required of me. For, in my view, gentlemen, ours is a science far too noble in its character, and involving far too many gen-

eral interests, to be hampered with any monopolies. A patent for a particular mode of regulating teeth, seems to be as absurd as a patent for a particular mode of setting a bone or curing a fever. There is something almost sacrilegious in the very idea. Everything we discover for the benefit of human kind, should be known and read of by all men. It should be published in the streets, and

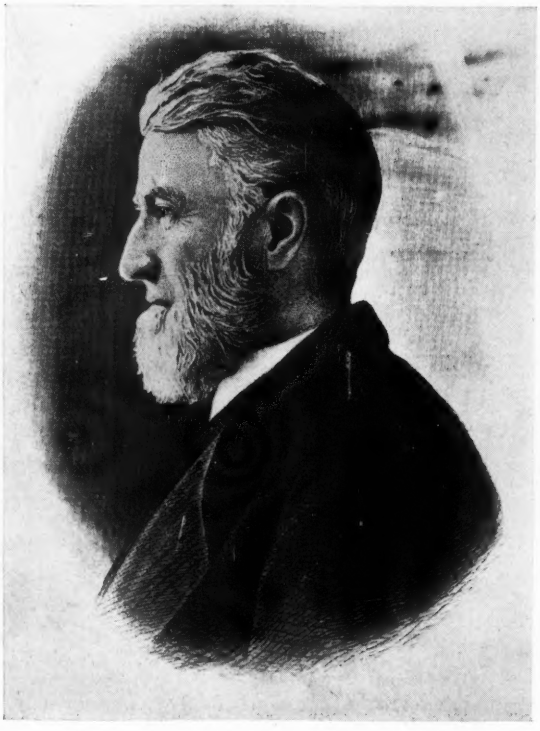

Fig. 21.—Asa Hill. He gave to dentistry Hill's stopping.

proclaimed from the house-tops, that thus we may humbly imitate that generous Providence, which sends its rain alike upon the just and unjust, and scatters its light broad-cast over the whole face of the earth."

The original article was not illustrated, those used are from a review of the above article by *W. Storer How* and published in the *Dental Cosmos,* 1891.

DEPARTMENT OF
DENTAL AND ORAL RADIOGRAPHY

JAMES DAVID MCCOY, D.D.S., EDITOR
LOS ANGELES, CALIF.

DENTAL FOCI OF INFECTION, THEIR CAUSE AND PREVENTION*

BY E. A. SCHRADER, D.D.S., INDEPENDENCE, IOWA.

I BELIEVE that medicine in the future will consist largely in a search for foci of infection, and their removal, that instead of treating symptoms, as rheumatism, heart trouble, etc., it will be a search for the particular focus of infection causing that malady.

The following list of diseases is an exact copy taken from the *Journal of the Research Committee of the National Dental Association.* This Association is composed of the leading members of the medical and dental professions.

"Systemic Diseases Resulting from Oral Infections."
Arthritis Deformans.
Iritis and other Eye Troubles.
Focal and Diffuse Kidney Infection. (Nephritis or Bright's Disease.)
Blood Vessel Coat Disease.
Heart Infections, as Endocarditis and Myocarditis.
Stomach and Duodenal Ulcer, Appendicitis.
Liver Infections, including Cholecystitis and Gall-Stones.
Skin Diseases, including Erythema Nodosum and Boils.
Nervous System Infections, including Neuritis, Neuralgias, Tic-Douloureux, Sciatica and Herpes Zoster.
Glandular Infections including Thyroid, Pancreas and Lymphatics, etc.
Pneumonia and Lung Infections.

It is not claimed that foci of infection in the mouth are the most frequent or the most important. The mouth up to the past few years, and with many of the medical profession, still is completely ignored, but to make a thorough diagnosis for the cause of systemic disease, it should have a complete examination. We should do team work. The dentist and physician must work together.

When a systemic disease exists, due to focal infection, and the cause is not known, the teeth should be examined first, as there are more teeth than other parts to produce infection, and infection is more easily removed from the mouth.

It was thought that all teeth were healthy which were comfortable and performing the functions of mastication but the x-ray shows many such teeth diseased.

*Read before the Delaware County Medical Society, Manchester, August 8, 1916. Published by special permission of Iowa State Medical Society.

In some cases, there are rarefied areas over the apices of the roots, places where part of the bone has been absorbed. We do not know what germs these areas contain without a culture being taken.

The germs found in diseased areas about the teeth are according to Gilmer and Moody, mostly streptococcus, both viridens and hemolyticus, bacillus fusiformis, together with other organisms such as staphylococcus aureus, or albus, micrococcus catarrhalis, and in two instances, diphtheroid bacilli have been found. The streptococcus viridens seems to be the germ most commonly found.

Some of these rarefied areas exist, according to the Chicago Research Committee, where the tooth once had an abscess to cause this absorption, and was later treated and the root filled. Instead of filling in with bone tissue, it filled in with connective tissue, and contained no pathological germs. If a patient has some systemic disturbance caused by a focus of infection, and no other source has been found, these areas should either be curetted with the amputation of the end of the root, or the tooth extracted with curettement.

Dr. E. C. Rosenow has for some years been conducting a series of experiments which can leave no room for doubt, as to the culpability of the teeth and tonsils in the production of such systemic diseases as articular and muscular rheumatism, endocarditis, streptococcæmia, and other allied conditions.

Starting with a certain form of streptococci, Rosenow was able, by varying the culture conditions under which he grew the organisms, to transform the original type into other types of streptococci which we have been accustomed to look upon as distinctly different from one another in their biological, serologic, and chemical characters. Not only was he able to produce different forms of streptococci, but he further changed streptococci into diplococci of pneumonia and vice versa.

The essential cultural factor which he used in bringing about these changes was a variation in the degree of oxygen tension. He showed that rheumatism, etc., were embolic in origin; that is, that a clump of organisms became lodged in a capillary loop which was too small to admit of its passage, and would locate in a given tissue for which the given organism had a particular affinity. If this was in a heart valve, an endocarditis resulted, if in the tendinous end of a muscle, a muscular rheumatism, if in the synovial membrane of a joint, an articular rheumatism. Teeth affected with pyorrhea, inflammation around ill fitting crowns and bridges, and impacted teeth are foci of infection found in the mouth.

DEAD TEETH.

The largest number of foci of infection in the mouth are caused by dead teeth. They may die from several causes, such as decay, a severe blow, hypercementosis, pyorrhea, and the dentist. If we could have the cooperation of the patient and dentist, there would need be but few places of infection from this cause. When the nerve dies from decay, it suppurates, forming a fine tube of pus to infect the tissues about the end of the root. It may cause an acute abscess, with severe pain and swelling, or a blind abscess with little or no pain, with no external evidence of trouble or may lie dormant for some time without any apparent trouble. Many times the aforesaid conditions are treated, but

enough of the infection remains to leave a blind abscess with no outward manifestations, and which causes systemic disturbances. A number of dentists are taking up the method of ionizing the nerve canals which are infected, to not only disinfect the canal but to drive the sterilizing agent into the deeper tissues. According to our x-ray findings, rarefied areas will fill in with new bone, after being ionized, if they are not too extensive. If extensive, they can only be cured by amputating the diseased end of the root and curetting the affected area, or extraction and curettement.

In case of extraction of teeth with blind abscesses, the tooth should not only be extracted but the diseased area curetted. These blind abscesses may cause the absorption of areas as large or larger than a pea, sometimes a half inch in diameter.

TEETH DEVITALIZED BY DENTISTS.

This, I believe, forms the great majority of cases of focal infection. On this account nerve operations are condemned by many physicians, but the operation is not to be condemned so much as the manner in which it is done.

The late Dr. Eissen found in 1000 cases examined where teeth had been devitalized, .3 per cent of perfect root canal fillings showed signs of disease. This may have been due to a lack of asepsis. He found 13 per cent of perfect root canal fillings out of the 1000 cases.

Dr. Elmer S. Best found out of 3000 cases of devitalized teeth, 10 per cent of perfect root canal fillings.

In my own practice, of 155 devitalized teeth examined, twenty-four had mechanically perfect root fillings, 117 had mechanically imperfect root fillings and fourteen had no root fillings. Of the perfect root fillings, one had a rarefied area over the root. Of the teeth with imperfect root fillings and no root fillings, 107 had rarefied areas.

When the nerve is entirely removed under aseptic precautions, and the root is sealed to the end, there is little danger of infection from that tooth.

When the nerve is not perfectly removed, a small end remains which later decomposes and suppurates. It then infects the tissues about the opening at the end of the root, causing either an acute or chronic abscess with or without a fistulous opening. It is generally a blind abscess without any external evidence of trouble, but forming a focus of infection for some systemic disease, or nature may take care of it without apparent trouble.

We know that Nature is doing a great deal to take care of these conditions, as nine out of every ten of the nerve operations are not perfect, and about 70 per cent of these improperly filled canals have rarefied areas over them. So there are but few mouths that do not either have some of these imperfect nerve operations, some impacted teeth or pyorrhea as a source of infection, and yet most of these people are healthy, but we do not know when these germs may become active and some systemic disease result.

You may ask, what right has the dentist to perform these nerve operations improperly, and who is responsible for these diseased conditions that have been caused by them?

We can only plead ignorance as our excuse and add that we consider ourselves excusable in the past because we did not know and did not have the methods of doing perfect root-canal operations. Until recently we considered all nerve operations successful if they prevented further toothache.

Quoting an extract from Dr. Howard Raper's lecture at the Panama Pacific Dental Congress: "In the first place I take it that we can agree that there

Fig. 1.—Blind abscess on lower bicuspid. Imperfect root filling. Patient subject to headache much of the time.

Fig. 2.—Same as Fig. 1. Six months after bicuspid has been ionized and filled with a perfect root-filling. Note the new bone about apex. Headache much diminished after treatment. Third molar has been removed.

is such a thing as poor root-canal operations. In fact most nerve operations are of this kind. I do not agree with the man who says, 'Our nerve operations are a disgrace.' Mirl Stro says, 'It is no disgrace to wear rags, the disgrace lies in continuing to wear them.' The extensive use of the radiograph and the theory of infection has set a new standard. Methods which fulfill the requirements of the old standard, fail to meet those of the new, and consequently must be discarded, and replaced by methods which prevent instead of aid the

development of foci of infection. This places the dentist in rather a difficult position." Dr. Henry Carr facetiously expresses it: "If he does his nerve operation as he has been doing it, he gives his patient heart trouble. If he takes the time necessary and does it as he now believes it should be done, he gives his patient heart failure when he presents his bill."

If we do this work properly it will make the fee seem exorbitant and pro-

Fig. 3.—Bicuspid with imperfect root-filling, draining directly into antrum.

Fig. 4.—Root between the first molar and second bicuspid. Extraction sixteen years previous. Was the cause of neuralgia.

hibitive; but if it is the only way to prevent these teeth at some time causing, in a certain per cent of cases, rheumatism, etc., we must adopt the latter method or the patient run his own risk, that by saving a few dollars and not have it done properly he might contract one of the many diseases which result from focal infections.

There are men who are placing no root filling in their nerve canals nor

removing all of the contents, but relying on some paste to preserve that dead nerve. These teeth are a very frequent source of trouble and on making a culture from these supposedly mummified nerves, at a later time they are found to contain pathogenic germs.

I know of a case of an actress who left the road on account of severe headache. The x-ray showed three such filled teeth. On opening and draining these teeth, the headache ceased. In the light of our present knowledge I be-

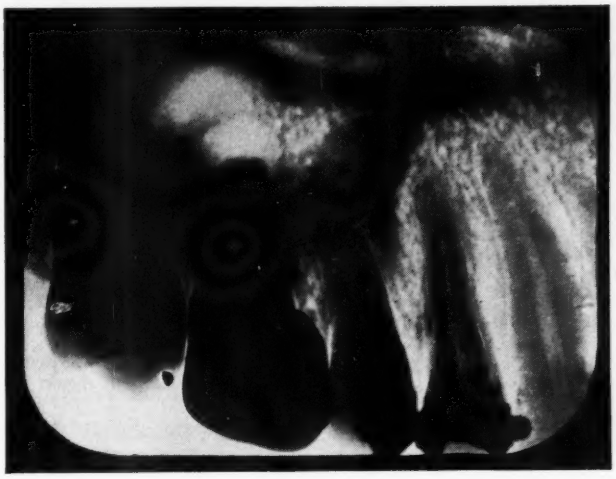

Fig. 5.—Large cyst above molar. Tooth devitalized but no root-filling.

Fig. 6.—Pyorrhea pocket with instrument showing depth below level of gum.

lieve that such root canal work is criminal. Suppose some of these teeth would cause a painful case of rheumatism and heart trouble and on finding them devitalized with unfilled roots which the x-ray shows badly diseased, these are removed and the patient gets well. Is this not cause for criticism? Quoting what some other men have to say on this same subject:

Dr. M. I. Shamberg, Oral Surgeon of the Post-Graduate Hospital and School of Medicine, N. Y. "The sad reality faces us today that our hospitals

are filled with patients who are bedridden, some crippled for life and aye! many of them dying, as a result of focal infections about the teeth and jaws.

"There is no longer any question as to the large variety of systemic dis-

Fig. 7.—Perfect root-filling in left central incisor. Other central had been devitalized twenty years. No apparent trouble but patient had goiter. Note large cyst.

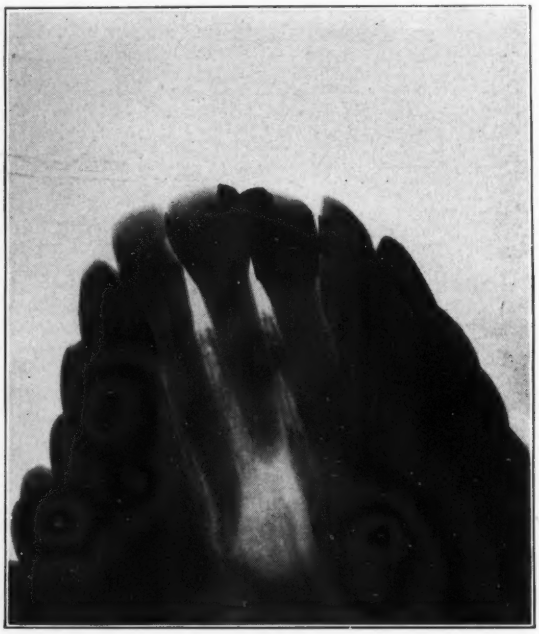

Fig. 8.—Same as Fig. 7 immediately after root has been perfectly filled and amputated and cyst curetted.

eases that are due to oral infection, and herein lies the great problem before us today. In the cases of polyarthritis where structural changes have taken place within the joints, and atrophy of the limbs have resulted from prolonged

non-use, only slight improvement will take place because the injury is too great to permit of repair. It is therefore incumbent upon you to exercise prophylactic measures and thus prevent these serious diseases of mankind.

"I have noticed hundreds of cases in our wards, that patients who seek charity at our hands give evidence of having spent considerable money on a type of work that is common to our dental parlors, and of unscrupulous dentists who are putting gold crowns and bridges in the mouths without regard to the damage that work produces. It should be considered a crime to put a gold crown or bridge on a tooth unless that tooth is properly prepared to receive it.

"We need a few Billy Sundays to go through the country before the members of the dental profession, to teach not only the doctrine of prophylaxis, but extraction of teeth where they are likely to be a menace to the health of the patient."

Dr. H. S. Vaughan, New York: "Roots filled by careful men and supposedly all right in the light thrown by the x-ray have been shown to be a source of infection. These infections may be from the small blind abscess or the larger bone abscess or have undergone cystic degeneration and perhaps involved a large number of teeth, then we have them breaking into the antral sinus, or the nasal cavity. These cases often require extensive surgery in order to effect a cure; and all this due to imperfect canal work.

"Radiography is not a luxury, it is an absolute necessity in the light of what is being proven. The work in the past has been the treatment of existing diseased areas, that of the future prevention."

Many times when you look into the mouth, you ask your patient how his teeth are. He says "perfectly comfortable" as he has just had them fixed and they should not trouble him, for most of the nerves are removed. You may exclude the mouth after hearing this in your diagnosis but as soon as he mentions devitalized teeth you may be on the right track. You may send him back to his dentist for an examination but no such examination can be complete without the use of the x-ray, and the dentist must be conscientious enough to condemn his own work if it is found to be at fault.

In my own practice, three years ago, a case presented with the teeth badly worn off. These were restored to the original shape with gold inlays. From the excessive wear some of the nerves may have been diseased before the teeth were filled or they may have later died from the irritation of the fillings being too close to the nerve. Last winter he developed an attack of rheumatism and was confined to bed. One antrum was affected which was opened through the nasal cavity. His physician questioned him about his teeth but he said they were fine, never gave him any trouble since they were fixed. He was confined to bed three weeks after which the one knee remained stiff and he was able to get around with crutches for about two months. Being my patient, I persuaded him to have his teeth x-rayed. Large areas of absorption were seen in region of both antra and on extracting these teeth, found these areas to extend into the antra. A few weeks after the last ones were removed, he was able to discard his crutches and go to work. In his case two teeth

were extracted and curetted at each operation. Each time, for a few days following, his condition was worse, due to the germs getting into the circulation after breaking up the abscess walls.

It is a mistake to take out too many teeth at one time when a patient is suffering from infection. Cases are on record where this has been fatal.

Some years ago I removed a nerve from a tooth of my wife's. For several years she had been having headache in the back of her head, having it a good share of the time. She consulted eye specialists, and general practitioners without relief, always kept a supply of aspirin and phenacetine on hand. Was fitted with glasses but this did no good. In February a radiograph of this tooth was taken and it showed an area about the size of a pea that was absorbed.

Fig. 9.—Large cyst caused by devitalized tooth without root-filling.

After opening and ionizing the tooth it has almost cleared the headache. She also had considerable pain in the region of the heart previous to treatment but which has now disappeared.

CROWN AND BRIDGE WORK.

The subject is claiming considerable attention at the present time. Leslie's Weekly has had some very good articles on this subject. Dr. Hunter of London started the criticisms when he condemned American dentistry, and we became quite indignant, but we must admit in the light of our present knowledge, that he was right to a great extent and a number have changed their methods, but far too many have not.

Most of the abutments for crown and bridge work are devitalized teeth. We know that nine out of ten devitalized teeth are not perfectly done. That makes nine out of ten subject to infection, then place an additional burden on these already weakened teeth, we have the reason that so many bridge teeth are a source of infection. The same thing holds true concerning crowns as

root-canal operations. It is the exception to see a properly fitting crown. To make a properly fitting and sanitary crown requires considerable time. The nerve operation is generally thrown in without extra charge.

The dentist with an average degree of skill would consume on an average of three hours for a perfect root canal operation on a molar and two hours on the crown. Then if it cost him $1.50 (about the average cost for each producing hour) he would make a profit of 50 cents net for five hours work. So you can see why crowns are not sanitary. I shall pass a few samples around that you may note the fit at the gum margin and you can see the favorable place for filth.

A crown can be made sanitary, but it requires considerable more time than is ordinarily given the operation.

Fig. 10.—Small blind abscess at apex of crowned bicuspid with imperfect root-filling. The removal of this tooth with six others in the same month cleared the case of rheumatism, heart trouble and neuralgia.

IMPACTED TEETH.

The next source of infection are impacted teeth. Some may have part of the crown visible, the presence of others can only be determined by the use of the x-ray. They may cause neuralgia, insanity, ear disorders, and eye disorders or any diseases caused by other foci of infection.

The late Dr. Henry S. Upson of Cleveland, Ohio, has cured cases of melancholia, mania, and dementia precox, by locating and removing impacted teeth.

Since certain forms of insanity might be cured by locating abnormal oral conditions, it would seem that there should be a competent dentist in each hospital. He should also be an expert roentgenologist.

Dr. Craig, M. D. of the neurological hospital of New York says: "The continued swallowing of pus is undoubtedly the cause of disorders of digestion, and finally an anemic state almost cachectic. This depleted exhaustive state may be associated with a melancholic state. It seems a far cry from mouth infection to mental disease, but where one witnesses profound depression clear up following the drainage of several pus pockets, one is persuaded that the

chronic intoxication, the result of absorption from the pent up infectious process, was an etiological factor."

Dr. E. A. Rogers of Iowa University and myself made an examination of patients in the insane hospital just as they happened to be brought to us.

Fig. 11.—Large cyst remaining after a tooth had been treated for a fistulous opening and not cured. Showing perfect root-filling.

Out of forty lady patients, one had teeth which could be pronounced healthy. The other thirty-nine had one or more defective teeth, some mouths fairly reeking in pus and so offensive that we had to hold our breaths to look into them. Might not some of these people be retained there on account of their teeth? Up to this summer, our insane hospital has had no dentist on the

staff, but they now have one and I believe he will do much to better the condition of the patients.

Dr. Upson cites a case of hypomania where a lady had screaming spells, was nervous and sleepless, but whose condition was cleared up by removing an impacted tooth and an abscessed tooth.

A physician twenty-eight years old became maniacal, talked foolishly but insisted nothing was the matter. Was cured by removing an impacted cuspid. He also cites a case of St. Vitus dance cleared up by removing impacted teeth.

Quoting from his book on insomnia and nerve strain: Of the viscera responsible for the more obscure cases of nervous and mental derangement, I have no hesitation in designating the teeth as the most important." There seems to exist among physicians not only a disregard, but a distinct, though mild dislike of the teeth as organs to be reckoned with medically. Ordinary pain at a distance, as headache or neuralgia, due to the teeth, though well known, is commonly disregarded." According to Dr. Upson's table including two and one-half years' observation out of forty-two cases operated on for dental disorders, where the patients were insane and dental foci were suspected, fourteen made a recovery and twelve improved. The different maladies were manic depressive type, dementia precox, psychosis, insomnia, neurasthenia."

PYORRHEA.

Pyorrhea is another source of infection and if recognized early, usually is curable, but if progressed to the stage that the teeth are loose, little can be done for it, as the bony wall surrounding the teeth is gone and not a sufficient amount of new bone will regenerate to hold the teeth firmly in their sockets.

The treatment of the early stages of pyorrhea is not difficult and the disease is easily cured unless complicated with some systemic disease, as syphilis, etc., but as we ordinarily see it, it is easily cured. Dentists do not seem to pay much attention to it until the teeth start to loosen, and then they have little success with it. In the later stages it requires a high degree of skill to remove all deposits and unless this is done, there is no hope for a cessation of the disease. Many beautiful sets of teeth are lost, which if taken in time would have been as easy to save as the ordinary teeth are saved by filling. The one great trouble is that the dental student expects to get all of these methods of treatment at college, and he should. He is taught the treatment of pyorrhea, it is true, but the treatment is not sufficiently thorough, neither do they have instruments properly shaped to reach all of the surfaces of the roots and this is essential for a cure. A set of instruments has been invented with which all surfaces of the teeth can be reached but they can only be obtained by taking a special course, and I believe every dentist should have this course. Some men get enthusiastic over the use of some remedy in the treatment of pyorrhea, claiming great results for the medicine but state incidentally that all deposits be removed and the surfaces of the teeth made smooth, that after making six injections all signs of pus disappear. By removing all deposits and making the surface of the tooth smooth, the flow of pus will cease with one treatment unless complicated with some systemic disease. I do not believe many realize

what a filthy disease pyorrhea is. In a bad case, it would not be unusual to have a pocket under the gum of each tooth a quarter of an inch in depth. Suppose they have twenty-eight teeth. Then we have a pocket the total length of which is seven inches. This is filled with pus and in addition food is pressed into it to decompose. Then after a time, some of these nerves may die, due to the movement of the teeth or to the pus infecting them, and we also have some blind abscesses develop. If we get a drop of pus from each pocket every twenty-four hours, which I think we will, that would be approximately one-half drachm of pus to be swallowed and that from the blind abscess to be discharged into the blood stream. Nature is very kind to tolerate this condition, but she often rebels. As in root-canal operations, there are not enough dentists doing this work that it may be of any help to you in focal infections.

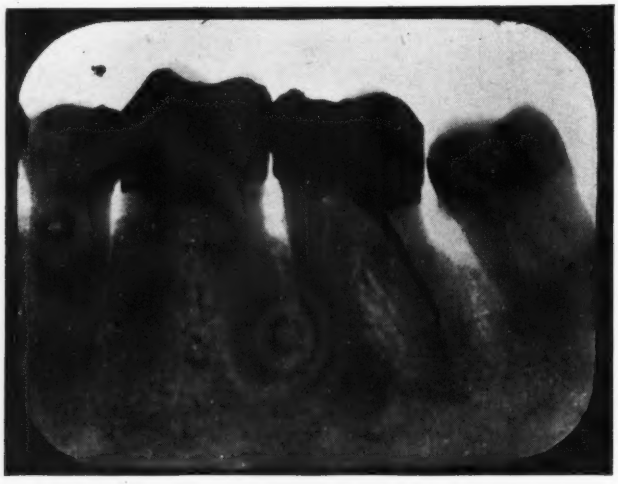

Fig. 12.—Blind abscess on mesial root of second molar and distal root of first molar causing systemic disturbance.

When the time comes when dentists will specialize and do their operations in the most thorough manner, then they will be of considerable help to the medical profession in eliminating disease.

Since we are finding that the teeth are often found to be the source of infection, there are among the professions, men who will go to the extreme and advise the extraction of many healthy teeth. This is being done at the present time, but after a careful examination including x-ray, the teeth are found to be healthy, we have no right to advise extraction.

At this time it may not be out of place to cite a number of cases.

Dr. R. T. Woodyatt has called attention to the frequency with which exophthalmic goitre is associated with infected mouths. He has also collected a number of cases of glycosuria in which infections of the mouth were present and the glycosuria disappeared after the infected teeth or tonsils were removed.

As an example I will cite the following case from my practice. Condition of patient reported by Dr. F. F. Agnew.

Patient, age twenty-four years, first seen December, 1915; patient had had trouble for six months; loss of weight, nervousness, insomnia, body tremors and weakness. Examination—Thyroid gland moderately enlarged and firm. Tremor of fine character and general.

Pulse rate 120-140. Exopthalmus pronounced, von Graefe and Stellwag signs positive. Examination of the mouth revealed four blind abscesses and one impacted third molar. Improvement was early noticed after mouth condition was cared for, and now the patient is in every respect normal, even to size of thyroid without medical or surgical treatment.

Dr. Martin Fischer, professor of physiology in the University of Cincinnati, relates a number of cases among which is a surgeon who had suffered three years with rheumatism of the right arm. He had six lower teeth affected with pyorrhea. After having these six extracted, in two weeks the rheumatism had left.

If you will permit I shall cite more cases from my practice, for they will show the benefits to be derived by removing foci of infection about the teeth. These cases did not receive medical treatment.

Case of a lady who had her trunk packed to go to Colfax for rheumatism of shoulder Came in to have an abscessed tooth removed before she left. The rheumatism began to leave and in ten days was gone without going to Colfax.

Case of swelling of knees existing for ten years. Was sent to me to see condition of teeth badly affected with pyorrhea. At this time she was suffering from severe tonsillitis which her physician thought might be caused from the bad condition of teeth. She also had some heart trouble. Extracted worst pyorrhea teeth and treated balance. Tonsillitis, swelling of knees, and heart trouble left. It has been two years since this was done and there has been no recurrence of her former symptoms.

Case of headache of several years' standing cleared up by locating a partially dead nerve. Case sent with following description: High blood pressure, 200 M. M. systolic. Markedly accentuated second aortic, intestinal disorders of a low grade toxic sort. Also complains of so-called rheumatic pains. An examination revealed rarefied areas over seven teeth, one penetrating the antrum. These were extracted and curetted in March, 1916. A letter written by the patient August 1, 1916, states that she has been relieved of rheumatism, severe heart trouble and almost constant neuralgia in head and neck. Also stomach trouble is much relieved.

Case of physician who had an infected antrum. A Denker operation was decided upon. A diseased molar was located under the affected antrum, after the removal of which the antrum cleared up.

In all cases of antrum infection it should be determined if diseased teeth are causing the infection. One case had had two antrum operations without benefit, but which was later benefited by removing a diseased tooth. Of nineteen cases of rheumatism of which I have a record, where the foci of infection were removed from the mouth, eighteen were improved; one reports no improvement.

Stomach trouble, of two cases, both were improved.
Arthritis, of five cases, three report improvement, and two no improvement.
Heart trouble, three cases, all three improved.
Goiter, one case improved.
Iritis, one case improved.
Ear trouble, one case improved.
Headache, three cases improved.
Antrum, three cases improved.
Most of these cases report marked improvement.

Up to the present time, we have not been diagnosing all pathological conditions in the mouth, but have concerned ourselves too much with the repair of teeth.

AN UNUSUAL CASE HISTORY

By H. B. Hamilton, D.D.S., Ithaca, N. Y.

NOT long ago, a dental friend, in a spirit of raillery compared the orthodontist to a certain widely advertised remedy, saying that all the orthodontists had to do was to put on the appliances and let them work while you sleep. Unfortunately there is occasionally a case where the orthodontist puts on the appliance and then loses sleep trying to make them work.

The following brief report of a case illustrates this point. The patient, a boy of about nine, presented a comparatively simple case of distoclusion, the short cusps of the molars being the only unfavorable feature. The boy was of German-American parentage, very large for his age, and decidedly husky. His tonsils and adenoids had been removed and the healing was normal. He presented a perfect type of the healthy vigorous boy, but rather clumsy and blundering, and a terror to the parents of other boys.

As a patient in the chair he was ideal—nothing seemed to cause him even the slightest annoyance, but it was almost an impossibility to keep an appliance on and in repair. He was too husky,—every time he came in something was lost or broken, and he always had a good reason for it.

The prognosis was favorable, so while it is not completed, yet a very good correction has been obtained despite the difficulties. The following extracts from the case record show what happened:

Oct. 30th.—Cemented molar bands.

Nov. 3rd.—Fitted in 17 gauge platinum gold arches.

Nov. 10th.—Left superior band loosened, recemented.

Nov. 17.—Upper arch gone. In showing to a boy friend, the boy grabbed it and pulled it out and threw it away. New arch.

Dec. 8th.—Right intermaxillary hook broken off and left badly bent in trying to eat a frozen apple.

Dec. 22nd.—Upper arch close to buccal tube. Caught his fork in it.

Dec. 29th.—Upper arch broken at both buccal tubes. Some reason.

Jan. 5th.—Right superior molar band off and arch broken.

Jan. 12th.—Arch broken.

Jan. 19th.—Right superior band broken. New band.

Jan. 26th.—Left superior molar band broken. Upper arch broken. New band adjusted.

Feb. 9th.—Left inferior molar band broken. Upper arch broken. New band and new arch.

Feb. 22nd.—Upper arch broken at both buccal tubes. Lower arch broken in the middle and right superior molar band broken. New band.

March 1st.—Upper arch broken at both buccal tubes. New arch of 15 gauge nickel silver, with loops at buccal tubes.

March 8th.—Lower arch broken and left hook broken on upper.

March 15th.—Left hook broken on upper.

March 22nd.—Lower arch broken. New arch 16 gauge nickel silver similar to upper.

March 29th.—Left superior band broken.

April 12th.—Right inferior band gone.

April 19.—Lower arch lost.

April 19.—Lower arch lost.

May 10th.—Upper arch broken. New arch.

May 31st.—Left inferior molar band gone. Did not replace as mesiodistal had been corrected and the lower jaw was otherwise normal.

June 7th.—Left superior molar band gone. New band.

July 5th.—Upper arch lost. New one 17 gauge.

July 12th.—Upper arch lost. New one 15 gauge.

These few mishaps, together with the impossibility of keeping a ligature on and the arches being bent out of shape almost every time he came in, were the only difficulties encountered.

No retention other than the upper arch to maintain the width has been attempted, as I know of no way of making an appliance strong enough to resist the vigor of his masticatory efforts.

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EDITORIALS

Editorials in Dental Journals

THE strength of a scientific magazine and newspaper is based largely upon the virility and power of its editorial department.

It is through this department that the policy and purpose of the publication is set forth to its readers, and through this department its greatest influence can be exerted. A weak, namby-pamby, vacillating editorial policy is indicative of a publication that stands for little or nothing in human affairs, and a publication with no avowed editorial policy or aim is nothing but an advertising makeshift calculated to catch the unwary and the unskillful merchant or manufacturer.

A true conception of the purpose of a magazine or newspaper is that they are intended to be a factor in educational uplift, either of the classes or the masses. If this conception be correct, then it is necessary for them to hold unswervingly to an editorial policy that gives a stamp of individuality to the publication.

News is not always educational in its truest sense but experiences and opinions of men with authority to speak and write are the great educational factors in the world.

In looking through the files of dental journals published in past years one is impressed by the absence of editorials. Plenty of dental news is in evidence and an abundance of original contributions but unless one was advised to the contrary he would naturally think that the dental journals of this and other countries published in the past had no definite policy, were not interested in educating their readers, and were run solely for commercial purposes.

Looking at the dental profession today one wonders if it would not have been further along in its scientific development if dental journals had arisen in the past to the supreme heights of their possibilities, and had boldly and with courage fought for better and still better dentistry, and for more thoroughly equipped dentists. If such had been the policies of dental journals in the past would dental schools still be run for personal profit, would students be matriculated with no regard for their fitness to take up a professional career, and would society have been cursed with the flood of bad dentistry, that all who understand conditions know has been foisted upon it? Timely and powerful editorials in the public press have helped in bringing about social reform. The *Journal of the American Medical Association* ten years ago attacked editorially the commercialized medical college, the low educational standard required of the medical matriculate, and the dishonest medical nostrums advertised as patent medicines through medical journals and the lay press. As a result of this propaganda for medical reform, the commercialized medical school has folded its tent and, like the Bedouin of the Desert, has stolen away. The matriculate in medical schools in this country must have educational achievements equal to the best universities in Europe, and the patent medicine faker has been driven from trench to trench, until nothing shields him now except the lowest types of the medical and lay press.

All this brought about in one decade! Medicine has advanced more rapidly in America during this time than in any country on earth and the incentive to this change has been supplied largely through the editorial department of the *Journal of the American Medical Association* and other self-respecting medical journals that have joined it in this uplift work. The crime of dental journalism in America is revealed by the refusal of members of the dental profession when they prepare research articles of especial value to let them first be published in dental journals, preferring to have them published in medical journals. Would this condition be, if there were dental journals that had, during years of service to the dental profession, developed an editorial policy that compared in power to that enjoyed by numerous medical journals of this country; that had stood for reforms of all kinds and character in dentistry; that had driven with relentless energy the unfit from the ranks?

Who is responsible for the opinion so prevalent today that a dentist is but little more than a refined plumber? Would this be possible if dental journals that have been published regularly for so many years had done all they could editorially to better dentistry? An editor of a scientific journal has an

opportunity to do much in an educational way. His duties may make him unpopular with those who have entered professional work merely as a cloak to graft and plunder; but to those in the profession who are trying to render service such efforts are understood and appreciated. It is pitiful to see a journal, published in the interest of a scientific profession, devote its energies to helping the members of the profession increase their monetary income and say never a word editorially that assists in the scientific development of the members of the profession.

There is more to dentistry than mechanics. True it is that man is the only animal that can use a tool; but scientific dentistry means more than the skillful use of instruments. There are problems in dentistry that need the careful consideration of the most scientific minds in the profession, and the opinion of such minds should be given outlet through the editorial departments of dental journals. Editors of dental journals everywhere should take up the scientific problems of dentistry and discuss them vigorously and scientifically. They should seek to arouse interest in problems that mean better dentistry, not more financial returns for bad dentistry. When one takes up dentistry or medicine as a commercial career he will be doomed to disappointment. But he will not fail to make a comfortable living in a dignified manner for himself and family. One of the arguments against dental journals owned and controlled by dental manufacturers and dental supply houses is that such organs cannot have a bold, vigorous, and progressive editorial policy. They are bound to be hampered by conditions pertaining to the business of which the journal is a part and such conditions will in ninety-nine cases out of one hundred stifle a broad-gauged, dominant educational policy. Can it be thought for a moment that the *Journal of the American Medical Association* could have become the power it is today for medical uplift had it been owned and controlled by a corporation that profited by selling or manufacturing supplies for physicians?

Because it was unhampered, it grew; until today it bears the distinction of being the most powerful medical journal in the world, and the association that it serves has done more for scientific medicine than any organization ever assembled in the history of medicine as a science. What dentistry needs is journals that will fight the cause of scientific dentistry editorially; that care not one jot or tittle for firm or manufacturing affiliations—if such affiliations throw a cloud upon the scientific conduct of the journal; that will hew to the line; that will inspect, expose, and condemn the unfit; that will fight against fraudulent articles that are advertised for use among the dentists or the laity; and that will educate the dentist how to do better dentistry and the laity to demand better dentistry.

The *Journal of the National Dental Association* has an opportunity now to render dentistry a real service—as a monthly publication it will be able to wield a tremendous influence in the uplift and betterment of the profession. It desires and should have the support of every state and local society. If it will adopt an editorial policy that is in keeping with the trend of modern dentistry, if it will bow to nothing but that which is for the benefit of the cause it represents; then dentistry will have a champion that will indeed be its friend.

Dental Fees

MUCH has been said and written in the past about fees for dental service. There are men practicing dentistry who believe in charging for their services at so much per hour; others believe in charging a fixed fee for calls, irrespective of service rendered; others believe in making a price when work is started and adhering to this, regardless of complications unlooked for when the case is started but that may arise during the course of the treatments; and there are still others who believe that prices should be charged in accordance with services rendered and the ability of the patients to pay; these also maintain that the value of services rendered cannot be ascertained until after the work has been completed.

With the first group we do not agree. Professional men should not estimate the value of their time at so much per hour. When they do this they class themselves with the mechanics and should be satisfied with mechanics' wages. Few dentists care to do this. The advocates of this plan talk much, but think little, and their vision is quite restricted. Their reasoning is illogical and will not bear cold and careful scrutiny.

With the second class we beg to disagree. Such a course is unfair to the patient and to the dentist. It gives the patient an opportunity to impose upon the dentist and certainly gives the dentist an opportunity to slough his work and impose upon the patient. These temptations should be removed as much as possible for the good of both parties.

With the third class we cannot agree because hard and fast rules can never be applied in professional work. You cannot look at a bird and tell how high it can fly. Neither can the dentist look at the condition of teeth that need dental service and tell the complications that may arise in the treatment of them. Nature is most uncertain in her treatment of Man. A seemingly simple condition may develop into one most grave and dangerous. Work that you thought might be completed in ten hours may take twenty; one must then either slough his work, be unfair to the patient and himself, or put in the time necessary to do the work well and be imposed upon.

With the fourth and last class we heartily agree. It is true that practicing dentists in the country must do much work out of which they get small returns but this they must be prepared to do, and must do it for sweet Charity's sake. In the cities this is not so necessary because the clinics at dental colleges and infirmaries take care of the poor. Those who are capable of paying for service rendered must be charged accordingly, not overlooking their ability to pay. Dentistry well done should be well paid for. To fill or crown a tooth well is worth about as much as to do a simple curetment, remove a clean appendix or repair a lacerated perineum; but in the one case $8.00, $10.00 or possibly $15.00 is charged; in the other, $50.00, $75.00, to $500.00. Take the nose and throat specialist; submucous resection, $50.00, $75.00, or $100.00; adenoids, equally as much; tonsils, as much or more. Surely a dentist to do his work well must have as delicate and refined a technic as the nose and throat operator but he gets much less for his work though his services to the patient may mean equally as much or more than that of the surgeon.

In rendering professional service there is but one guide. Do the best you can. Your ability to serve may be limited but those who possess two talents are not to be expected to do as much as those who possess ten. But condemnation rests forever upon those who possess ten talents and render a service equal to the ability of those who possess only two. The capable conscientious dentist knows what his services are worth and he knows the ability of his patients to pay. Conscience is a correct guide and he who follows it makes few mistakes. When you trust your purse to an honest man you do not need to count the pennies when you put it in his keeping and then again when it is returned. A patient in the hands of an honest dentist will be justly treated and rendered a just and honorable bill.

Propagandists who spend their time in helping the dentist to get more fees would be better employed if their efforts were directed toward helping the dentist do a better class of work, and thus merit greater fees. In the long run service plus attains its reward. The honest, capable dentist need not worry about financial returns. His chief concern should be more ability—more light. In the aggregate his fees will balance the service rendered when he does his best and strives to attain the true professional man's noblest aims.

Dental Judgment

JUDGMENT may be defined as the complete understanding of a situation or a condition and the will to apply one's ability to the successful management of the matter in hand. We speak of good and bad judgment, thus indicating one's ability, or inability to cope with situations as they arise.

Good judgment in the professional man is a valuable asset and one that is essential to the achievement of signal success. It is, however, an elusive goddess and can only be won after arduous efforts. Wishing and hoping for judgment is not enough. It must be sought for with untiring energy and a devotion to one's work. It must be nurtured in an atmosphere of courage and resolute will. Judgment never set the sign of its approval upon the coward's brow. He who would possess it must also wear the badge of absolute honor because judgment has nothing to do with the dishonorable man.

Good judgment to the dentist is his sheet anchor. With this trait well developed he need not worry because to him the crooked will be made straight, the tangle will unravel, the knot will be untied; but, good judgment in dentistry will only come after one masters the science, develops the courage to put his theory into practice, and has the integrity to resist the temptations that beset one to sacrifice truth and honor for financial gain. Judgment in dentistry, like judgment in surgery, is the child of wisdom; and to beget this off-spring one must constantly toil. A restricted vision is never conducive to sound and reliable judgment. One must see the ideal with the eye of imagination and then make the ideal a realization.

The dentist who is only mechanical in his work will never be reliable in his judgment. The vision is too restricted; the foundation is too frail. He must

know more than the mechanics of putting on a crown or filling a cavity. He must think logically, correctly. He must know chemistry, both organic and physiological. He must know physics and be well versed in the physical properties of metals. He must know bacteriology, and understand the principles of immunity. He most know pathology, both gross and microscopic. He must be a good physiologist and an accomplished diagnostician. He must be able to correctly advise his patients with reference to the bearing of dental conditions upon the health. He must know that an apical infection, untreated, will in time result in an endocarditis or an arthritis; that facial neuritis is most frequently of dental origin; and that septic pneumonia can frequently complicate an impacted, infected third molar. He should know when it is best to crown, fill, or extract; whether a plate or a bridge will render the most efficient service: and he must have sufficient psychic power to convince the patients that he knows what is best for them. He must be quick to recognize the defects of childhood and warn against adenoids, enlarged tonsils, and rickets. He should know the ultimate result of malocclusion upon the general health and either be able to correct it or advise reference to a specialist.

With a thorough knowledge of dentistry and its close relationship to general health, the dentist with judgment must also know how to successfully handle the patient. Knowledge is of no value unless it can be applied. A dentist's ability and judgment is of no value unless he is able to successfully handle his patients and convince them of the difference between good and bad dentistry. Quack dentists flourish because they are skilled in the art of handling people. They do bad dentistry but win financial success because they have the ability to impress the people. They sell their personality, not their technical skill. Christian Science is a bastard child of religion and science. Yet this cult has flourished, at the expense of scientific medicine. The healers have sold personality, not scientific ability. Dental judgment, therefore, must not be remiss in handling the patient. Tact and skill in this endeavor are just as necessary as the ability to successfully cope with the physical and pathological conditions as they are found.

To train students in order that they will develop a high degree of judgment should be the highest ambition of the dental teacher and the clinician. For this reason care should be exercised by universities in accepting matriculates and none but those with a broad preliminary education should be allowed to enter the dental ranks. A stream can rise no higher than its source, and the axiom still holds true that "you can't make a silk purse out of a sow's ear." You can't create a dental profession the members of which will have sound judgment and broad vision unless you carefully select those who enter its ranks.

Judgment in dentistry, as in surgery, can be attained; is necessary if the highest purpose of professional success is reached; and will, when achieved, twice bless, both the giver and the one who receives.

The Influence of Diet on the Development and Health of the Teeth

IN the November, 1916, issue of the *American Journal of Obstetrics,* Doctor J. I. Durand, of Seattle, Washington, presents the results of an investigation of the incidence of caries in teeth of 5000 children with reference to feeding in infancy. The highest percentage of caries was found among those fed on sweetened condensed milk. The percentage of caries among children who had been breast-fed was 28 or 29 per cent; among those fed on sweetened condensed milk 61 per cent. A well-balanced diet has a direct influence on the development and the health of the teeth. Breast milk or properly modified cow's milk with the early addition of vegetables has been shown to be a suitable diet; certain vegetables may be given as early as the sixth or seventh month of life and are a valuable addition, preventing rickets and spasmophilia. A second point of importance is to provide a diet that teaches the child the proper function of the jaws and teeth. For this purpose hard foods are useful, such as dry bread, celery, lettuce, etc. These give additional work to the teeth and jaws and further proper development. One of the points in the prevention of caries is that the last article eaten at a meal should not be as is customary, a soft, sticky, carbohydrate food, as cake, but some hard, cleansing food, as meat, a green salad, or some fibrous food. A hard food and vigorous efforts at mastication have a function in wearing down any roughness of the teeth. An examination of the skulls of primitive races gives confirmative evidence that the character of the food has an influence in the development and health of the teeth. A study of Maori skulls showed that in these the incidence of caries was only 0.76, while among Maori children today in a civilized environment the incidence of caries is 15 per cent. In the North American Indians the incidence of dental caries was from 1.0 to 3.9 per cent. It is shown to be low in other primitive races.